



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

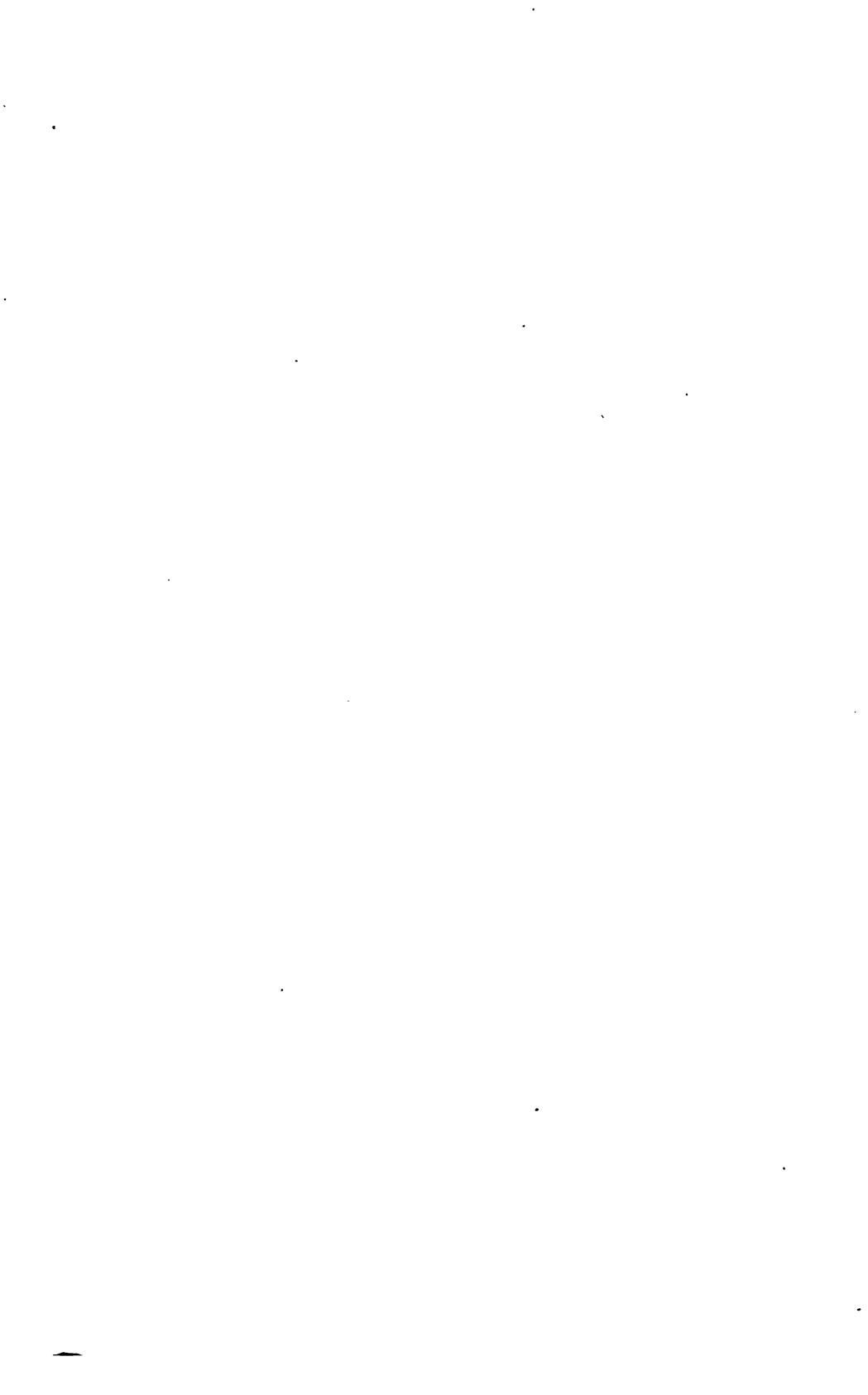
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

BOSTON MEDICAL LIBRARY
IN THE
FRANCIS A. COUNTWAY
LIBRARY OF MEDICINE







THE PRACTITIONER

**PRINTED BY EVRE AND SPOTTISWOODE,
HIS MAJESTY'S PRINTERS,
EAST HARDING STREET, E.C.**

THE
PRACTITIONER
A Medical Journal.

EDITED BY
W. CECIL BOSANQUET, M.D.

JANUARY-JUNE, 1904.

"THE PRACTITIONER," LIMITED:
30, HOLBORN, LONDON, E.C.
1904.
All Rights Reserved.



THE PRACTITIONER.

8234
JANUARY, 1904.

ENTERIC OR TYPHOID FEVER.

INTRODUCTORY REMARKS.

By SIR WILLIAM BROADBENT, BART., K.C.V.O., M.D., F.R.S.,

Physician in Ordinary to His Majesty the King; Consulting Physician to St. Mary's Hospital, and to the London Fever Hospital.

FEVER has from time immemorial been looked upon as the touchstone of clinical sagacity and skill, and it is as important in the existing state of medical science and practice as it ever was that the symptoms in a case of fever should be carefully watched and noted, and rightly interpreted.

Typhoid fever in an especial manner affords scope for watchful care, well-informed judgment, and prompt intervention. The aspect and expression of the patient, the position he assumes in bed and the disposition of his limbs, the presence or absence of slight movements of the hands, or twitching of the lips, or tremor of the tongue, the degree of alertness of the intelligence as observed from day to day—all have their significance, and supplement the data afforded by the pulse, respiration, temperature, and tongue ; they may indeed give more accurate indication of the tendency, favourable or unfavourable, of the disease, and earlier intimation of danger, than the pulse and temperature, thus giving the opportunity for treatment. But in typhoid fever, in addition to the degree and character of the pyrexia and the evidences of toxæmia, there are the effects of the intestinal lesions and of the associated catarrh, the character of the stools, the degree of distension of the abdomen, the enlargement of the spleen, all of which demand daily attention.

The thermometer has brought precision into the study of fever, and has been of inestimable service both in the diagnosis and treatment ; but it has led in everyday practice to much



laxity of observation in other respects, and too frequently the temperature has been treated instead of the disease—which is one stage worse than treating the disease only, and not the patient who is the subject of the disease.

The diagnosis of typhoid fever is admirably set forth in Dr. Claude Ker's contribution on another page. It cannot be made with confidence in the first few days of the disease, and the difficulty of its early and certain recognition has been increased since influenza became prevalent. Influenza, indeed, not infrequently ushers in an attack of typhoid ; and, instead of the gradual rise of the temperature and development of the symptoms, the onset has the suddenness and violence of influenza, and the characteristic features of typhoid may supervene without any marked fall of the temperature, or the influenzal pyrexia may subside and be succeeded by the gradual typhoid rise. Influenza apart, the old rule holds good that fever steadily increasing for a week without local inflammation may, with few exceptions, be set down as typhoid. Corroborative symptoms will usually have set in by this time, and we must continue to rely on clinical indications for early diagnosis. The exceptions, excluding tuberculosis, will mostly be examples of fever due to colon-bacilli which have acquired special virulence ; and such cases may prove fatal. The Widal test is of great service in rendering the diagnosis certain, and may be said to have displaced the less trustworthy diazo reaktion of the urine. Recourse should be had to it in every case, since it may also yield information as to the virulence of the typhoid poison ; but it is not available at a very early stage, and, as it depends upon the formation of an antitoxine, the clumping of the test-bacilli may be imperfect in cases in which the constitutional resistance is deficient and the danger therefore serious. It is sometimes useful to try cultures of different strains of bacilli when the reaktion is equivocal.

Perhaps the most instructive part of the series of papers is the juxtaposition of the four articles dealing with the treatment. Read together, they will produce a greater impression, and will lead to a more careful comparison of the different methods than if they had been perused separately as part of an article on typhoid fever generally, and thus they will conduce to greater decision of mind on the question of treatment. One

point which comes out strongly is that the temperature is not to be dealt with as such, and repressed without regard to the part it may play in the defensive operations taking place in the system, or to the after-effects of antipyretic drugs. Another is that feeding must not be overdone, or stimulants regarded as necessary. It is to the ultimate advantage of the patient that the supply of nourishment should be restricted, rather than that food should be given which may aggravate the intestinal catarrh or irritate the ulcerations, or may increase the risk of complications such as haemorrhage or perforation, or prolong the fever. While milk, with barley-water or soda-water, peptonised if necessary, is in most cases the best form of food, it must not be given simply to quench thirst. Two pints may be regarded as sufficient. Many physicians, however, have abandoned milk in favour of whey, with or without egg-albumen, and there is abundant experience showing that whey affords adequate sustenance. The milk or whey may be supplemented by broth, but strong beef-tea and meat-extracts are of doubtful value. Water should be given freely. "More water" is the Johns Hopkins watchword. In Osler's wards it is pressed upon the patient to the amount of 6 or 7 litres *per diem*.

Whatever the plan of feeding may be, the medical attendant should, if possible, see every stool. The degree and character of the intestinal catarrh are thus ascertained, the adequacy or insufficiency of the evacuation of the bowels, the presence or absence of undigested food. Should curds, small or large, appear in the motions, milk must be stopped, or lessened and peptonised.

The adoption of the bath-treatment by Osler in its most uncompromising form, with the success attending it, is perhaps the best testimony to its value and efficacy which has yet been given. There are difficulties in carrying it out in private practice, and it would be largely impracticable out of hospital, if it were necessary to lift the patient into and out of the bath; but on the Continent patients often step into the bath, and even walk to it, and if systematic bathing is begun early before the exhaustion is very great, it may be possible to continue it. The temperature approved by ordinary experience is 85° to 70° F. The ice-cold bath may be necessary in hyperpyrexia,

when not merely abstraction of heat is required, but a powerful impression on the nervous system.

Drugs should be employed only with a definite purpose, and in cases pursuing a mild and normal course may never be necessary. Disinfection of the intestinal tract should not be attempted with a view to destroy the typhoid bacillus. It may be useful in counteracting secondary fermentation produced by other bacteria, which is the usual cause of flatulent distension and sometimes of diarrhoea with specially offensive motions. Various drugs are recommended. I have personally found liq. hydrarg. perchlor. or small doses of calomel most trustworthy. The indications for the administration of drugs should be carefully studied in the articles by Sir John W. Moore Dr. Herbert Hawkins, and Dr. McCrae.

A most important part of the duty of the physician is to recognise early, and deal promptly with, complications. This applies particularly to perforation, as is insisted upon by Dr. Hector Mackenzie, who also describes the symptoms attending its occurrence. Immediate operation affords practically the only chance of recovery. For the extreme tympanites coming on rapidly at an early stage tinct. opii should be given. Haemorrhage should be met by arresting peristalsis by opium and by ergot given subcutaneously, an ice-bag being applied over the right iliac fossa. Rigors are always disquieting, but fortunately not necessarily of serious import. Their causation and significance are well brought out by Dr. Bolton.

Prevention demands attention as well as treatment, and it must always be borne in mind that the typhoid bacilli are often present in the urine as well as in the faeces. Dr. Newman's important and interesting article indicates the different channels of communication in London, and shows that contact plays a much more important part in the spread of the disease than is generally supposed. In India, Egypt, and South Africa, dust and flies are vehicles of the bacilli. A remarkable difference between India and Egypt is brought out in the communications of Dr. Andrew Duncan and Dr. Sandwith. In both countries the incidence of typhoid fever is upon young, newly-arrived Europeans, mostly soldiers; but, while in India the native races suffer, in Egypt they appear to enjoy almost complete immunity, as is shown by extensive hospital experience and

thousands of post-mortem examinations. These papers will furnish important reading to medical officers going out to India or Egypt.

In warfare typhoid fever has always to be reckoned with as a deadly enemy. All authorities agree that it dogs the steps of armies in campaigning. On this account the scheme for supplying soldiers, on the march and in camp, ably and enthusiastically advocated by Dr. Canney, demands the serious attention of the military authorities. Professor Wright's preventive vaccination has an even wider scope and more general application, and may be available for the protection of young soldiers in India and other countries.



ENTERIC FEVER, WITH SPECIAL REFERENCE TO EGYPT.

By F. M. SANDWITH, M.D., F.R.C.P.,

Consulting Physician to Kasr-el-Ainy Hospital, Cairo.

Arabic Synonyms :—Homa typhoideeyeh. Nausha.

HISTORY.

ENTERIC fever is said to have been known to Hippocrates and Galen, but it was not until the former half of the nineteenth century that it was distinguished even in Europe from typhus. Pruner, who lived in Egypt from 1834–1846, says that typhoid was then very rare among Egyptians and negroes, but he saw cases in Greeks, Armenians, and Syrians, especially among children between 3 and 15 years. He also saw a few sporadic cases in natives between 8 and 14 years old. He noticed that diarrhoea was seldom a symptom ; but whenever he had the chance of making an autopsy he found in the small intestines the lesions he had seen in Europe in cases of typhoid fever. Griesinger a few years later found 15 cases of "ileo-typhus" among 1,087 patients at Kasr-el-Ainy Hospital, six of which were verified by post-mortem examination. Colucci Bey has recorded that typhoid fever broke out in the provinces of Upper Egypt in 1860, 1862–1863, and was carried in June 1862 to the Suez Canal by labourers from Upper Egypt, so that the Sanitary Department of that day had to prevent the arrival of any more workmen from the Upper Nile. This may, of course, have been enteric fever, but tradition in Egypt says that malaria was conveyed in this way at that time. Cerf-Mayer reported typhoid from Alexandria in 1869, and Vauvray found it at Port Said in 1873.

In 1883, on my arrival in the country, I saw enteric fever among the English soldiers in Cairo, and a few scattered cases among Egyptian soldiers, and I found that the disease was well known to our European colleagues, though many of them

were surprised at the English method of treating cases by a pure milk-diet. Since then no year has passed without cases occurring among the Europeans.

DISTRIBUTION.

Enteric fever is found all over the world, and is very common in many places in Africa and Asia, though there is apparently some immunity in tropical and sub-tropical countries. With regard to its diffusion in Egypt, it has seemed to me that we are going through the same cycle of belief which swayed medical opinion in India. In that country, about fifty years ago, the dogma passed unchallenged that India enjoyed an absolute immunity from typhoid ; a few years later it was recognised that the disease occasionally occurred ; and now it is universally believed that it is by no means an uncommon disease, even among the natives.

I have often heard it stated in Egypt that no adult Egyptian suffers from the disease, and the erroneous theory has been propounded that most Egyptians have suffered from this fever as children, thus procuring an acquired immunity among the adults. I think I may dispose of this theory quite shortly by stating that I have performed, or assisted at, the post-mortem examinations made upon several hundred children under the age of 5 years, most of them being compulsorily brought to the hospital after death, because they belonged to the Foundling Department of the Egyptian Government. These children were formerly farmed out to the poorest women in Cairo and Alexandria, who lived in insanitary huts, many of which contained stinking latrines. The unfortunate children died of diarrhoea, broncho-pneumonia, and various forms of septicaemia, but never in one single case have we ever found pathological evidence of enteric fever, while those cases which I have carefully watched during life, to elucidate this very question, have never displayed clinical symptoms of this disease, nor answered to the serum-test.

However difficult it may be to explain, it is a fact that, whereas enteric is very seldom absent from the European hospitals in Egypt, it is a very rare visitor to the wards of Egyptian Government hospitals, which are frequented almost

entirely by the natives of the country. This is true of some 25 hospitals, but I need only give details of the largest of them. At Kasr-el-Ainy I saw a case in 1890 of a Berberin cook from the Barrage, who lived with an English official there; no one else in the house had the disease, and his was a mild attack, but, in my opinion, an undoubted one. After that I had to wait until 1898 before I could get a hospital case to show to the students. In that year two were admitted, two others in 1900, and one in 1901; thus giving, in all, six cases in 12 years, out of a total of 8,752 patients admitted to my half of the medical wards.

During the early part of these 12 years I conducted the autopsies, and never met with a case of enteric in the post-mortem room. When I was succeeded by Dr. Kaufmann, he found one doubtful case in 1,100 autopsies. Since then Dr. Symmers has published a report on 835 post-mortem examinations, extending over three years, without one single case. These figures are enough to show, either that enteric is very rare among those who attend Government hospitals, or else that those suffering from that disease do not seek relief for it at the hospital. But in this connection I must state that many of the hospital patients consist of policemen and other Government employés, who are obliged to come to State hospitals when they are on the sick list. The following figures show that the Egyptian troops suffer much less than the English soldiers:—

—	Average Strength.	Average Cases of Enteric.	Per 10,000.
English Army in Egypt, 1888-1902 -	4,045	105	259
Egyptian Army in Egypt, 1892-1902 -	2,837	5.8	20
Egyptian Army in Soudan, 1892-1902	15,323	32.6	21

It must not be forgotten, too, that the Egyptian Army, both in Egypt and the Soudan, consists not only of native troops, but of several British officers and a few non-commissioned officers, who help to increase the enteric sick-rate.

The peasant population of the villages is not provided with any conservancy arrangements, and therefore performs all acts

of nature upon the ground in the open air, a proceeding which would be impossible except in a land of daily sunshine. The unclean habits of the villagers, and their carelessness as regards food and drinking-water, predispose them to many diseases, but not, apparently, to enteric. When a recruit leaves his village to enter the army, he is drilled, well-fed, given filtered water to drink, and consorts with other picked, healthy men, and improves consequently in general health. But he becomes liable to a slight amount of enteric fever while he is in contact with Europeans.

Yet when, after five years' service, the soldier is transferred to the police, or returns to his village, he seems to regain his immunity from enteric. In order to try and explain this, it must not be forgotten that the soldier, during his army service, is at a most susceptible age (say 20 to 25 years), and also, that while army cases of enteric cannot remain undiscovered, and must be sent to hospital, where they are recorded, there is no such compulsion among the civilian fellahs, who may, therefore, suffer more than one thinks from sporadic enteric, disguised under the name of "nausha."

But, in spite of this, I have sometimes wondered whether the enteric fever in both English and Egyptian armies is not encouraged by the latrine methods employed; theoretically, earth and disinfectants are freely used, but practically, great care cannot always be taken to prevent enteric faeces and urine from becoming dried, pulverized, and swallowed with food by a susceptible individual before the typhoid-bacillus is dead.

The comparative immunity of the rural population does not extend to dwellers in towns, for enteric fever is now met with in Egyptians every year in Cairo, Alexandria, Port Said, Suez and other places, chiefly during the summer. At Suez, for instance, there is a large staff of English clerks of susceptible age, and in July and August, 1891, there were eight cases among them, aged 18 to 26, besides eight other cases among the natives in the town. Since then there have not been so many patients at any one time, but only dropping cases now and then. I am not at all alone in the belief that Egyptian town-dwellers now suffer more from enteric fever than they did fifteen or twenty years ago. Though I attended a Coptic interpreter

suffering from this disease in Cairo in 1883, it was quite rare for many years to be called into consultation on a case of enteric in a native. But for the last few years this has been by no means an uncommon experience. If the Egyptian becomes in the future as liable as the European to this fever, the Sanitary Department of Egypt will have a hard task before it. I cannot quote statistics of the number of cases of enteric in Egypt every year, because many fevers are returned only under one heading; but in an unsuccessful attempt to induce the Egyptian Government to establish a drainage system for Cairo, I collected most of the cases occurring in the seven winter months of 1890-1. The four chief hospitals and the private practice of fourteen leading doctors belonging to six different European nationalities gave me a total record of 102 cases, and of these 96 were contracted in Cairo.

CAUSES.

Age.—In the English Army of Occupation the majority of cases occur between 20 and 25, and the highest admission-rate is during the soldier's first three years in the country, so that admissions from enteric are greatly reduced after the fourth year in the command.

For many years in Egypt I had not seen a patient under 4 years, or above 57 years old; but in November 1901 I had at the same time two patients under my care, one an English child aged 18 months, and the other an Egyptian in the hospital wards, aged 65, both verified by serum-tests. My own hospital cases are, of course, not numerous enough to quote as statistics, but I have notes of 87 private patients, whose attacks I have either attended entirely or superintended. Of these, 21 were under 15 years; only six between 15 and 20; 41 between 20 and 30; nine between 30 and 40; eight between 40 and 50; and two between 50 and 57. Seven of them were under five years of age. The apparent absence of cases between the ages of 15 and 20 is due to the fact that most Europeans of that age are absent from Egypt for educational reasons.

Sex.—In Europe and America both sexes are equally liable, but of my figures only 35·6 per cent. were males, and 64·4

females; and if we include only the patients above 20 years, the male rate falls to 31·6 per cent., or less than one-third. This is enough to show that the young woman, whether visitor or resident, is more susceptible in Cairo than the young man, and therefore requires greater protection.

The *nationality* of my private patients is as follows:—4 Egyptians, 2 Greeks, 1 Belgian, 5 Americans, and 75 English, but it must be stated that the greater part of my practice has been among the English and the Americans. The two Greek cases are interesting, for they were mother and child. I attended the mother when she was five months pregnant with this child, and I thought I was justified in predicting that the child would not get enteric fever; but when she was two years old she contracted a mild typical attack.

The patients all belonged to the professional, or well-to-do classes; 36 of them were winter visitors, and of the remaining 51 residents, six were sick-nurses, three of whom were nursing enteric cases at the time, and certainly caught the disease from their patients. My cases also include a daughter who caught it just after nursing her mother, and two mothers who became ill while nursing their children. Five doctors are included in the series, but none of them were attending enteric cases at the time, and there is no evidence that they caught the disease directly from patients.

One of my patients was infected in England or France, and three others contracted the poison in Italy on their way to Egypt, while three more brought the disease with them from Palestine. Of the remaining cases, nine caught it in Upper Egypt, four in Alexandria, and two in Tantah, while for 65 others Cairo and its suburbs must be held responsible. It is, unfortunately, not a very rare experience to hear of Europeans leaving Egypt apparently in perfect health, and yet developing enteric on the steamer or in Europe on their way homewards.

Two-thirds of my 87 cases were either strangers to Egypt, or had been in residence for less than a year.

Prevalent Season.—The European statement, that autumn months are the most productive of enteric fever, is not borne out by my private cases, for I find that the winter months are even more dangerous in Cairo. Omitting decimals, the monthly percentage is January, 15; February, 19; March, 17; April, 5;

May, 4 ; June, 1 ; July, 1 ; August, 1 ; September, 6 ; October, 11 ; November, 8 ; December, 11. The diminution of cases in the hot months is partly due to the fact that so many persons get away at that time, especially women and children ; but it should be remembered that in many tropical and sub-tropical regions, the hottest months of the year are found to be the most productive of enteric. During the last ten years the British troops in Alexandria have suffered most from September to December, and least between February and April ; but in Cairo, where the garrison is three times larger, the most prevalent months for enteric in the army of occupation are October to December, and then April and May, while the least incidence is shown in February.

Campaigning is a very important predisposing cause in all armies, hence the French term "manœuvre fever." In spite of many sad lessons, general officers commanding European troops in the field do not seem yet to understand that enteric fever is one of the most dangerous enemies they have to fight. In 1897 the enteric admissions in the British army of occupation during the year were 67 per 10,000 men, but in the following year, being that of the Soudan expedition, the admission-rate rose to 810, though it fell again in 1889 to 75. There is nothing exceptional in this, for in the Spanish-American war of 1898 one fifth of the United States soldiers suffered from enteric, and in the two years of the South African war the English had 31,118 cases of enteric fever, with 6,177 deaths. Camp pollution, flies and dust as carriers of contagion into unprotected food, and the transportation of the poison in the clothing, are the chief additional reasons why enteric has so wide-spread a prevalence in camps during a war.

Enteric fever in the Egyptian army in the Soudan also reached its highest figures in 1896-1897, during the advance on Khartoum.

Drinking-water and Ice.—A few years ago it was thought that enteric was entirely a water-borne disease, but now, very many other means of conveying the typhoid-bacillus to the stomach of man have been discovered. In Egypt cholera has often contaminated the canal, pond, or well from which a town or village gets its drinking-supply, but there is as yet no record of a similar infection from enteric. Anyone acquainted

with the habits of the lower class Egyptian, and with the history of water-borne epidemics in other countries, can only suppose that the bacillus is not a common inhabitant of the sewage from which the country wells are so little protected.

In individual cases of the disease it is generally impossible to know by what means the poison has entered, and patients, especially if Americans, will often state that, while travelling, they have never drunk any plain water, nor unboiled milk. But occasionally one can trace the incubation back to a special day when an imprudence was committed. For instance, an English officer, in June 1894, while examining hundreds of men for a recruiting commission, and suffering agonies of thirst in the hot weather, drank some doubtful water at Tantah, and two weeks afterwards developed enteric fever in Cairo. In May 1903, an English boy was taken by his father to climb the Pyramids, when, exhausted by heat and fatigue, he drank some water from the *goulah* of an Arab ; sixteen days later he began a mild attack, which was verified by the serum-test ; yet, before and after his visit to the Pyramids, he had been fenced in by all the care and precaution against typhoid which his anxious parents could devise. Tantah and the villages near the Pyramids were both believed, at the times mentioned, to be free from enteric, and these are only two instances among many others which tend to prove the immunity of the Egyptian to this disease, to which the English and the Americans seem to be particularly predisposed. An English child, aged eight, whose mother had a nervous dread of the possibility of enteric, and who was, therefore, surrounded with more than usual care, was one hot day taken for a long ride by her father, and became very thirsty ; after some persuasion, she drank a tumbler of water from a well in the court-yard of the English riding-master's house, because she was assured that the family, which consisted only of adults, always drank from it. Yet three weeks later she developed enteric, and no other cause for it could be discovered. This is probably an example of the relative immunity which comes by acclimatisation rather quickly to adults living in hot countries.

Again, an English regiment, during a forced march in hot weather near Dongola, exhausted their drinking-water, and, maddened by thirst, rushed to an obviously unclean pond

which they came upon towards the end of the day. As a direct consequence of this act some 200 of them contracted enteric or dysentery, and 52 died.

I have never seen a case which could be traced directly to ice, though the bacilli have been known to live as long as 18 weeks in ice, the majority however dying within two weeks.

In October 1902, 39 cases occurred at Ogdensburg, which were traced to ice which had been taken from the St. Lawrence river eight months before. The ice, when melted, yielded besides other bacteria a pure culture of the typhoid-bacillus.

Milk.—In the spring of 1899 a score of cases occurred in Cairo, mostly among the children of English people who were most careful about their domestic milk-supply. The cause remained a mystery, until it leaked out that there had been a case of typhoid at the common dairy from which these families drew their milk. Seven of these children were under my care at the same time. It is well-known that in milk the bacilli undergo rapid development without changing the appearance of the milk, and they may live for several days in butter made from infected cream. Osler says, "One or two typhoid bacilli in a glass of water may be, and probably often are, taken with impunity by an individual not specially susceptible, but a few in water used to rinse a milk-can or jug, would find in the milk such a suitable medium for growth that in 24 hours the milk would be highly infective."

Ice-cream.—I have been able to trace one case to this cause. A little boy, well protected as regards milk, water, salad, &c., living in a sanitary house, used to spend his spare pennies in buying this refreshment from a man in the street. While attending this boy, I became aware of others of his comrades who had apparently also contracted this fever in the same way.

Oysters are eaten from both Alexandria and Port Said fisheries, and though the more careful inhabitants of these towns believe that they are not sufficiently protected from sewage contamination, I have not met with any case of enteric to be directly traced to this food. I have, however, seen two cases in Cairo, who apparently caught enteric from eating oysters in Italy.

Salad and Uncooked Vegetables.—These are of obvious danger, because the peasants, on their way to market, wash their green stuff on banks which are often freely polluted with human urine and faeces. The child of an Italian nobleman is believed to have got enteric in Cairo in 1903 from eating raw radishes ; he never drank unboiled water or milk, and never ate salad, but was devoted to radishes.

Flies are scavengers to be found everywhere in Egypt and the Soudan, and often alight on milk or other exposed food when coming direct from filth. They also endeavour to crawl about the face and mouth of human beings, and are most persistent in this, evidently searching for moisture. The infective matter conveyed by flies appears to be attached, not only to their heads, but also to their legs, wings and bodies.

Dust is probably often responsible for the direct infection of food such as milk, and this is helped on by sandstorms in the spring and a considerable velocity of wind all through the year. The bacilli retain their vitality in garden earth for 21 days, in filter-sand for 82 days, in street-dust 30 days, on linen 60 days, and on wood 32 days.

An English child in Alexandria apparently contracted typhoid by dust carried from a smelling heap of recently-imported rubbish, which had been shot down about 300 yards to windward of the patient's house. The child, aged 3, took all its meals at home, and lived on food specially cooked for it in the nursery. Other people, living in the same house and near it, were made ill by the smell, which gave them headaches and sore throats, but not typhoid.

My youngest case, of 18 months old, was also a well-cared-for English child, living in the desert, chiefly on buffalo-milk from an animal kept in the garden ; the supposition in this case is that the patient contracted typhoid by dust blown from a large collection of dried sewage stored in the direction of the prevailing wind.

Though water is the chief cause of outbreaks of enteric, it must be conceded that infective material carried by winds and flies may play an important part in the development of this fever.

Insanitary Houses.—Untrapped drains and cesspools,

ventilating directly into the house, cannot actually produce enteric fever, but they undoubtedly predispose individuals to it. For some few years after the English occupied Egypt, there was not a single house or other building which did not offend every law of hygiene. But when, by personal influence, we succeeded in introducing sanitation into a few hotels and houses in Cairo, the freedom from enteric in these caused many others to follow their good example. The following three instances, among many others, will show the intimate connection between this fever and insanitary dwelling-places, if it be remembered always that it is only the susceptible who contract the disease :—

(1) Kasr-el-Ainy Hospital, in the earliest reforms, was made less insanitary by substituting a system of daily removal of faeces for open latrines in the building, but slop-water and urine were still allowed to run into underground culverts which did duty as drains, for we adopted the ruling of the British army of that day, that protection from faeces was the only important essential. In 1884 an English resident medical officer was appointed for the first time, and four years later two English sisters were imported to superintend the female wards, near which they were given bedrooms. All these three Europeans developed enteric soon after arrival, and one died ; yet none of the Egyptian residents fell ill, and the same immunity was enjoyed by a family of English children, who were the only Europeans in residence. (One of these children caught enteric a few years later, when living in the town.) The existing underground culverts were then all dug up and filled in, and a system of drains and cemented cesspools was established for water-refuse. During the last fourteen years the European resident staff (aged 25-35) has been greatly multiplied, but no fresh case of enteric has occurred.

(2) The Hareem Hospital forms part of the Abbassieh barracks occupied by the British troops. In the summer of 1890, I saw in consultation the wife of an English officer suffering from phlegmasia dolens and ulcerated sore-throat after a miscarriage, which made me suspect sewage-poisoning. I found that a disused latrine had been cemented over and was used as a store-room for groceries, but a small hole,

carrying off water after washing the floor, had been forgotten, and communicated directly with a long conduit running parallel with the quarters of several regimental messes, whose bath- and sink-water ran into it. During the next 18 months six cases of typhoid occurred in regimental mess-waiters, and one English lady, who all lived in the adjoining quarters. As a consequence of this, the conduit was filled up, the sink-water was otherwise disposed of, and no more cases of enteric have occurred.

(3.) The Bijou Palace at the Citadel. In 1891 the English nurse of an officer's family developed typhoid fever here, and the next successors to these quarters suffered from fever, though it was not called typhoid. In 1892-3 another officer's wife quartered there suffered constantly from a mysterious fever, which did not appear to be typhoid ; but in the following winter, when her husband was moved to Abbassieh, she lost this fever, and has had none since.

In October 1893 another married officer was ordered into these quarters. His three children had already passed four years in Cairo, always in the best of health ; the two elder children, aged 8 and 9, had had enteric fever before coming to Egypt, but they suffered constantly from "fever" till May 1894, when they were taken to a house in Cairo, where they at once lost all tendency to fever and improved in health, weight and strength. Their youngest sister, aged 6, contracted enteric in March, and was ill for six weeks, including a relapse. I then persuaded the authorities to dig up the floor in the neighbourhood of the child's nursery, though the Royal Engineers said they were sure there were no drains there, but confessed they had no plan of the Citadel underground. When the floor was removed, they found four large disused conduits, about 10 feet deep and 3 feet wide, running in all directions ; one of them was close to the nursery wall, and a damp patch in the wall of this conduit corresponded with a damp spot on the floor of the nursery. These quarters were then condemned, and remained unoccupied till 1896, when an army medical officer, at his own urgent request, was allowed to occupy them temporarily, after the previous history had been fully explained to him. His wife and two children all

developed enteric, and since then this old palace has been definitely abandoned.

I could give, were it necessary, similar instances of enteric fever occurring in various generations of householders in Cairo, and similar stories with regard to army quarters in Alexandria.

It used to be believed that cesspools containing only sink- and bath-water were not dangerously productive of sewer-gas, but in May 1894 an English corporal and an Egyptian labourer were suffocated by gas from such a cesspool at the house hired for the General by the British Government. The native accidentally dropped in, and the corporal went after him to try and rescue him; a second soldier tied a rope round his waist and tried ineffectually to save them, but was hauled up unconscious.

The *urine* and *clothing* of enteric patients have lately been proved to be important factors in spreading the disease.

SYMPTOMS AND COURSE.

The symptoms of enteric fever seem to be similar all over the world with certain small exceptions. Constipation is very common in Egypt; 6 per cent. of my cases had neither constipation nor diarrhoea, while 47 per cent. suffered from constipation throughout the whole illness, so that enemas had to be employed every day or every second day. The eruption cannot be seen on an Egyptian, as a rule, but is very marked on white skins, and is by no means confined to the trunk. The highest temperature recorded was 107° F. on the nineteenth morning of an attack which ended favourably. In six cases the temperature never dropped once to normal for more than six weeks, and in the longest case the primary fever remained without a break for 55 days; all these six protracted cases recovered.

Mortality.—Eight per cent. of the private cases died of various complications, all except one being English ladies. It is worth noting that none of the constipated cases died. The post-mortem appearances are, as one would expect, exactly similar to those seen in Europe.

REFERENCES.

- Pruner : *Topographie Médicale du Caire.* Munich, 1847.
Griesinger : *Gesammelte Abhandlungen.* Berlin, 1872. Vol. ii.
Colucci Bey : *Compte rendu des travaux de l'Intendance Générale Sanitaire.* Alexandria, 1865.
Hirsch : *Geographical and Historical Pathology,* Vol. I.
L. Rogers : "Typhoid as a Common Continued Fever of Natives in Calcutta,"
Ind. Med. Gazette, January, 1902.
The American Commission on Typhoid Fever in Military Camps during the
Spanish War of 1898.
Horton-Smith : "Typhoid Bacillus and Typhoid Fever," *The Lancet,* March,
1900.
Corfield : "Etiology of Typhoid Fever and its Prevention," *The Lancet,* 1902.
Rho : "Camp Fevers," *Jour. Trop. Med.,* 1900.
Oeler : "Report on Typhoid Fever," *Johns Hop. Hosp. Repts.* Baltimore,
1894.



ENTERIC FEVER IN INDIA.

BY ANDREW DUNCAN, M.D., B.S. (LOND.), M.R.C.P., F.R.C.S.,

*Physician to Seamen's Hospital Society and to the Westminster General Dispensary ;
Joint Lecturer on Tropical Medicine, London School of Tropical Medicine ;
Fellow of King's College, London.*

THERE is probably no subject in medicine, on the ætiology of which more ingenious theories have been propounded, or which has enveloped itself in greater mystery, than enteric fever in India. I propose in this article to deal more especially with its causation, and to point out the manner in which the clinical manifestations differ from those seen in European countries. A few words will be added on its treatment.

And first let us survey the theories that have been held to account for its manifold presence.

(a) *The Vicarious Theory of Martin.*—Surgeon Martin of the Medical Staff advanced the following theory to account for its prevalence in the tropics. The factors inducing it were supposed to arise in the following order : (1) *Hepatic insufficiency.*—Owing to an excess of work being thrown on the hepatic system, either by an absorption of putrid matter or otherwise, there is an increased activity of that function. Soon, however, the organ ceases to bear the strain of elimination thrown on it. The second factor now comes into play, viz. : (2) *A vicarious and abnormal activity of the intestinal glands supplemental to the hepatic insufficiency.* This eliminatory function at length leads to a suppurative enteritis. This vicarious action is in its turn furthered by the third element, viz. : (3) *An idiosyncratic proneness of the glands to this abnormal function.* It will be sufficient to dismiss this theory if we consider that the glands affected in enteric fever are the solitary glands and Peyer's patches ; and in all works on physiology I believe these structures are held to have *absorbing* and not *eliminating* functions.

(b) *Surgeon-General Moore's Theory.*—The late Dr. Moore, Surgeon-General with the Government of Bombay, did not believe in the specific nature of any fever. Enteric fever with

him was but "a phase of fever," and not a specific disease, whilst the enteric spots were only a petechial eruption. The eruptions of enteric, typhus, scurvy, and purpura were identical. The only remark necessary with regard to this view is that the last three eruptions are permanent on pressure, whilst that of the first disappears on pressure.

(c) *The Self-poisoning Theory*.—Dr. Stich held that enteric fever might arise from poisoning by the contents of the intestine, which becomes noxious "under the influence of disturbing causes." This theory need not be discussed, for, as Laveran states, it has no precise facts to rest upon.

(d) *The Transformation Theory of M. Colin*.—M. Colin begins his theory by stating "All acute febrile conditions are accompanied by marked alterations in the secretions and by gastro-intestinal complications, which may induce the spontaneous development of typhoid." Next he states that this enteric fever is a unique malady in the tropics, and results from the transformation of fever primarily paludal into enteric. He also holds that in the tropics enteric fever may be spontaneously developed by transformation from all acute febrile states, which transformation takes place especially in young individuals who have recently left their native land for a warm malarial country. Apart from the fact that in certain tropical regions paludal fever and enteric have been found to exist in inverse ratio, as in Demerara and Guiana (concerning which localities Welch states in his monograph on enteric fever, "No less pronounced is the disconnection of the disease with the paludal fevers widely dispersed and frequently met with in these islands. Were enteric fever allied in origin to the paludal fevers, Demerara and British Guiana should have furnished a high ratio, whereas the opposite is the fact"), we have to suppose that the haematozoön of malaria in the tropical country of India becomes transformed into Eberth's bacillus.

(e) *The Climatic Theory*.—This theory states that "climatic influences acting on young and undeveloped constitutions predisposed in some way specially to develop typhoid may start the disease" (Clarke, quoted by Fayrer) : "that typhoid fever in the British soldier in India is primarily due to climatic influences" (Bryden) : that "it may have a malarious origin,"

and that "it is due to (1) predisposition, (2) age, (3) and want of acclimatisation" (Don). It may be summarily stated from these and similar opinions compiled in Sir Joseph Fayrer's work on the *Climate and Fevers in India* that this theory seeks to find a primary causation for enteric fever in India, and tropical and sub-tropical climates, in "climatic" agencies acting on young soldiers recently arrived in those parts. It is indeed one of the most extraordinary facts in the history of medicine that for a long time so many diseases in the tropics were held *vi et armis* to owe their origin to climate. Cholera some years ago was stated to be caused by "climate and other causes." No one, I suppose, in India would at the present day venture to promulgate this fantastic theory. In like manner enteric was held to be caused *per se* in some way by "climate." And with this theory was interwoven the influence of "atmospheric waves" of other writers. What idea can possibly be conveyed to the human mind by the assertion that "typhoid everywhere is of atmospheric, and probably of epidemic origin in India, and due to atmospheric causes"? "Epidemic constitution," says Billings, a distinguished surgeon of the United States army, "is merely another phrase for want of knowledge," in connection with this ætiology of typhoid. Truly did the late Professor Parkes, of Netley, a man with an unequalled balance of mind, describe such causation as the "mythical region of epidemic constitution." MM. Kelsch and Kiener again, in speaking of the meteoric origin of fevers in France, say that this idea has arisen owing to their ætiology not having been sufficiently determined. Again, Andral made an observation that would seem to have some reference to this question. He found that young medical students were most likely to be attacked with enteric fever within a few days of their arrival in Paris. He, however, forebore to state that there was something in the climate of Paris especially causing enteric fever in young, recently-arrived, medical students.

(f) *The View of Sir Joseph Fayrer.*—This distinguished medical officer thus speaks of the causation of the disease: "To attribute all cases of enteric fever to faecal poisoning is erroneous and dangerous;" and holds that "geographical position and climatic influences, heat, moisture, organic decomposition, miasmata, and a variety of aerial and telluric conditions are

more likely than a specific cause in India." He proposes to call tropical enteric fever "endemic," as distinguished from "specific" enteric fever. But all enteric fever is essentially endemic. Enteric fever, Murchison remarks, is *the* endemic fever of England, as it is of France and America. It is a peculiarity of this disease that it is endemic everywhere. And why should the view criticised be held to be dangerous? As a writer in the *A. M. D. Reports* for 1874 (p. 123) remarks:—"As no proof of this theory (the climatic) is offered, it would not be necessary to notice it, were there not danger that the practical effect of its acceptance would be to paralyse efforts to cast off this form of fever." The danger, in fact, lies in the *climatic*, not in the *specific* theory. The history of an outbreak amongst the troops in Natal in 1881-82 shows how some minds might attribute the disease to "climate." The circumstances are minutely detailed by Brigade-Surgeon Wm. Skeen in the *A. M. D. Reports* for 1881, who states that the immunity of the Indian regiments, and of those who had been some years in South Africa, and its prevalence in a severe form in the newly-arrived regiments and departmental corps, might make this (climatic) assumption probable. But he points out that from the position of the water-supply of nearly all the infected troops with regard to the latrines, and the quality of the water as disclosed by chemical analysis, the outbreak was due to its usual cause, faecal defilement of the water-supply, and that the apparent widespread diffusion could be accounted for by the movement of the troops from the centres of infection; whilst the escape of the regiments that had been some years in the country cannot be explained by acclimatisation, for this would not have afforded protection to the recruits of these corps more than to the young soldiers of the regiments recently arrived from England.

Before proceeding to the discussion of what I hold to be the true cause of the large prevalence of the disease in India, I wish to draw attention to two remarkable views held by the senior officers of the time in question. Some years back the P.M.O. of Madras, Surgeon-General Gordon, held that enteric fever did not exist in India. Subsequently to him, Surgeon-General Sir Anthony Home, V.C., the P.M.O. of Her Majesty's Forces in India, ordered that all cases of fever, in which at

the necropsy ulceration of the intestines was found, were to be returned as enteric fever. I well remember a senior surgeon-major informing me that he had in his weekly report returned a fatal case of malarial fever in which there was, at the necropsy, some ulceration of the intestine, not affecting Peyer's patches, or the solitary glands in any way, as malarial fever, but his report was sent back to him with an order that the disease was to be returned as "enteric." This order to return all cases of fever in which at the post-mortem examination ulceration of the intestines is found, would no doubt increase the returns for enteric fever, and would also show enteric fever to have arisen on inexplicable grounds; but the conclusion therefrom that enteric fever in hot climates arises from "climate" unfortunately rests on a false premiss, many cases returned as enteric fever not being enteric fever at all. Surgeon Wall, I.M.S., concisely sums up the question: "I believe that a large proportion of cases returned as typhoid fever have no right to that name. If a man die in India, after having an elevated temperature, and an ulcer be found in his intestine, the case is at once called typhoid. But it takes a great deal more than an intestinal ulcer to make a typhoid fever. I have seen many cases that could not with certainty be referred to any type of fever, but which had, on the whole, more resemblance to remittent than any other, and which were found after death to be coincident with intestinal ulceration, *but an ulceration distinctly not typhoid.* It was an irregular ulceration, by no means selecting the site of Peyer's patches, and very often encircling the intestines, and my experience is that this form of ulceration often occurs in cases that would better bear the name of remittent than anything else." The presence of ulcers in the small intestine in patients dying of fever has been constantly remarked on by different observers. Annesley, Twining, and Ronald Martin drew attention to it. Surgeon-Major Edge in the Zulu war found it, and differentiated the disease from enteric fever.

In 1886, in the Report of the Sanitary Commissioner with the Government of India, attention is drawn to the lax way of reporting intestinal lesions. "Every ulceration of the intestine not diagnosed as dysenteric seems to be at once put down as enteric, regardless of the fact that in Europe different kinds

of intestinal ulcers are recognised, and that the enteric ulcer is mostly confined within the limits of the follicles, or follicular patches, whereas the ordinary or non-specific follicular ulcer tends to overstep these bounds. There is no pathological improbability in follicular ulceration accompanying remittent or any other fever. In Indian post-mortems the recorded lesions seem on the one hand often too extensive and irregular to be characteristic of enteric fever : while on the other, cases occur in which, while the symptoms during life had satisfied the medical officer that the disease was enteric fever, absolutely no lesions were found after death which could be called enteric."

With regard, then, to this theory of "climate" being responsible for enteric fever in India, I would urge that "climate" *per se* can no more produce enteric fever than it can give birth to a tiger or a polar bear. Doubtless the environment of a hot and an arctic temperature respectively is adjuvant to the birth of these animals, but without preexisting members of these families, it would have no influence in their appearance.

Passing now from these untenable theories, what is the explanation of the large and increasing amount of enteric fever in India ? Can it be explained, or is it an insoluble mystery ? As I have indicated in the review of the old theories, some measure of its increase is doubtless due to the opinions laid down by senior and other officers. If enteric be but a phase of fever closely allied to typhus, scurvy and purpura ; if it can arise by a transformation from malarial fever ; if "atmospheric waves" or "epidemic constitution" come into play ; if "geographical position and climatic influences, heat, moisture, organic decomposition, miasmata, and a variety of aerial and telluric conditions" can cause the disease ; and if, finally, every fatal case of fever in which at the necropsy "ulceration" of the intestine is found, be enteric fever, then doubtless we have a satisfactory solution of the question. This factor in the past has certainly played its part. The commission appointed by the Government of India to inquire into the excessive prevalence of the disease at Lucknow and Meerut in 1888-89, held that this excessive prevalence was not to be attributed to absolute increase in the disease, but rather to

mere change of prevalent opinion. The figures, it states, during the last decade concerning the individual fevers are hardly applicable save as the result of a change in nomenclature. The anomalous excessive prevalence of enteric fever amongst officers in both localities suggests a suspicion of the diagnosis. Again, the Commission draws attention to the growing mass of records showing cases of fever in India closely resembling enteric fever in Europe, but *with different intestinal lesions*. These mistakes in diagnosis, however, are not likely to be made now by the highly-educated and efficient members of the R.A.M.C. The conditions the soldier meets with in India are of themselves amply sufficient, in my opinion, to account for the excessive prevalence. I well remember Professor Maclean at Netley, in his eloquent lectures, impressing on us the fact that India of all the places in the world was the country where one would expect to see enteric fever, owing to the insanitary conditions there present; whilst Surgeon-Major Shirley Deakin, whose comparatively early death from this fell disease caused so great a loss to the Bengal Medical Service, stated that he had "never yet met with a case of cholera or enteric fever in which the possibility of a specific source of contagion could be eliminated, and that as long as this was the case he failed to see the necessity or desirability of starting any 'climatic' hypothesis of causation."

Let us trace the history of the soldier in India. This country offers no exception to the two predisposing elements in the ætiology of the disease that are found everywhere, viz., (1) age, and (2) recent arrival.

(1) *Age*.—The admission-rate per 1,000 for enteric fever was as follows, from 1897-1901:—

Years.	Under 20.	20-25.	25-30.	30-35.
1897	- -	33·0	44·4	19·6
1898	- -	24·7	53·3	22·2
1899	- -	18·8	31·3	11·5
1900	- -	9·0	23·1	12·0
1901	- -	12·7	18·6	10·7
				5·4

(2) *Recent Arrival.*—From 1898 to 1901 the following was the ratio per 1,000 of admissions for enteric fever:—

Year.	Years of Service.				
	Under 1 Year.	2nd Year.	3rd Year.	4th Year.	5th Year.
1898	91·5	38·0	26·6	23·1	20·6
1899	51·6	30·3	11·6	10·7	8·2
1900	30·4	28·3	20·5	11·8	12·1
1901	37·8	12·8	18·1	11·9	10·2

Year by year each trooping-season introduces a quantity of material at the age most susceptible to the disease. Moreover it must be remembered that this supply of men of an age most predisposed to the disease is still more favoured by the frequent changes of men under the short service system. Dr. Welch truly says that if men were excluded from India up to 25 years of age, enteric fever would form but a very small proportion of the disease-returns. No recruit is supposed to be sent to India under 20 years of age. This regulation, however, is not carried out in its entirety. Thus, in 1884, 2,000 recruits were sent to India under 20, most of whom were but little over 18. Now in the ratios quoted above, there is seen to be a somewhat marked decrease in the latter years : but be it noted that owing to the exigencies of the Transvaal war there were *only a few drafts from England : the time-expired men were retained ; and thus the average age of the soldier serving in India was increased.*

Thus the soldier lands in India at an age most predisposed to the disease. What environment does he meet with there ? One of the stock arguments in favour of the "climatic" origin of the disease used to be that the sanitary arrangements in the barracks were such as to preclude any source of infection. Doubtless this is so. But does the soldier remain always in barracks ? He goes out shooting in the district : he resorts to the bazaar : and in other ways to be mentioned is abundantly exposed to infection. I suppose that there are few filthier places in the world than some of the bazaars of an Indian city, and on the supposition that the pythogenic theory of Murchison

is correct, there is an ample field here for its origin. But nowadays a case of enteric fever must arise from a preexisting case. Do the natives of India have enteric fever? This was formerly denied, but can now no longer be disputed. Ewart first showed its occurrence amongst the natives in the Ajmere Jail in 1856. He also saw many cases in Calcutta. Fayrer thought it "common enough," and quotes an outbreak amongst the Goorkhas in Assam confirmed by post-mortem examination. The late Sir William Guyer Hunter, from his experience as Professor of Medicine at the Bombay Medical College, stated that no race or sect was exempt. Surgeon-General Sir A. C. C. de Renzy drew attention to its prevalence in the Jail at Rawal Pindi, and O'Brien noted it in Assam. Wright had a series of cases in the 6th Bengal Infantry. Elliott of Madras states that all natives suffer from it at some time or other, and hence a degree of immunisation is established, rendering the fever atypical. Browne has reported cases in the medical hospital at Lahore. Buchanan showed 25 cases occurring in the Nagpore Jail between 1894-99, in nine of which the diagnosis was confirmed by the necropsy. Lamb has reported eight cases somewhat recently, and Leonard Rogers, the Professor of Pathology at Calcutta, holds that no race or creed is immune, and that over 80 per cent. of the cases of continued fever lasting as long as three weeks, proved to be enteric on using the serum-test. The introduction of this test has in fact been of the greatest service in the diagnosis of the fever amongst natives. Now, enteric fever having thus been proved to exist frequently amongst natives, we see how an ever-present source of infection surrounds the British soldier. An instructive instance showing how "inexplicable" cases of enteric fever may arise is recorded by Mr. Hankin in India. He was taking an early morning walk, and came across a "dudh wallah," or milkman, filling up his milk-cans, destined for the use of the British soldier, with water from a dirty roadside pool. Now supposing Mr. Hankin had not seen this, and had not reported it, and supposing that the added water had been infected, an outbreak of otherwise inexplicable "enteric" fever would have occurred.

The British soldier then frequents the bazaars, drinks the lemonade made there, or eats perchance the sweetmeats, and

thus may readily ingest the specific elements of the disease. The soil of India must by this time be largely impregnated with the bacillus of Eberth, and the vitality of this bacillus is not by any means feeble. Cayley records a case where the typhoid stools were burnt in a dunghill. Some five weeks after, five persons employed in removing dung from the heap were attacked with typhoid : their alvine discharges were buried deeply in the same heap. Nine months subsequently two men were employed in the removal of the dung-heap, one of whom was attacked with enteric fever and died.

But besides the faeces, the urine is a fertile source for conveying the poison of the fever. This was shown by Dr. Horton-Smith in his Gulstonian lectures. And it must be remembered that the specific bacilli persist long after the deservescence of the fever. They have been found in the urine 41 days after, by Lazarus. Dr. Petruschky showed, by the narration of an unfortunate accident, that the urine may be infectious to man. The sister of the ward accidentally drank a small quantity of urine which had been passed by a typhoid patient into a wine-glass, and after an incubation-period of 12 days she developed typhoid fever. This then constitutes a further and probably more frequent method in which the soil of India is contaminated. The native will not lie in bed longer than he can help in India ; he gets up, therefore, as soon as he is able, and during the day doubtless contaminates the ground by urination.

A fertile source of contamination is the *dust*. In the recent war of South Africa, the sandstorms doubtless disseminated all sorts of faecal and urinary contamination. At Quetta in 1898 an epidemic occurred. No case was admitted until May when the usual dust-storms began. The outbreak was preceded by sore-throat from the dust, and several cases also began with sore-throat. The filth-pits were to windward of the barracks, and the epidemic was worst in the lines nearest the pits. Again, an epidemic two years ago at Lundikotal in the Khyber began in June when the prevailing conditions were dust-storms, flies, and heat. At the end of July, when the excreta were removed for disposal one and a half miles from camp, the epidemic began to cease. Now anyone who has ever experienced a dust-storm knows how impossible it is to keep the dust out of

one's bungalow, and unless the food is most carefully protected, it must be contaminated by the dust.

Lastly we come to *flies*. Only those who have lived in hot climates can imagine rightly what the plague of flies must have been in Egypt. The report issued by the American Committee on the causation of the enteric in the Spanish-American war, adjudged the flies to be the exciting agents. In our recent war also they must have played a great part in the diffusion of the fever, and it is a curious thing that they were noticed to be particularly attracted by enteric-fever patients. In South Africa enteric fever rapidly disappears with the first appearance of the frost. This has been held to be due chiefly to the killing-off of the flies by the cold.

To sum up.—The great and increasing prevalence of enteric fever in India is due :—

- (1) To the constant arrival in that country of men at an age most predisposed to the disease ;
- (2) To the arrival of these men in a country whose soil must be everywhere impregnated with the poison of enteric fever ;
- (3) To the multiple means of access of the poison to the men especially predisposed to it by their age and recent arrival.

ENTERIC FEVER IN NATIVES.

Symptoms of the disease in India.—Before the introduction of the Widal test enteric fever in India was doubtless often overlooked, and returned as malarial remittent, pneumonia in the typhoid state, &c. Owing to caste prejudices, it is difficult to obtain a necropsy. As regards the general symptoms, there is marked prostration and hebetude with delirium, but this state is less diagnostic in natives, as it will be found also in other cases of continued fever or pneumonia. As regards the temperature, I have only once seen a "classical" enteric temperature-chart, and that was in a Goorkha. As a rule, there is a marked remission, especially at the end of the second week ; whilst frequently, after reaching the normal, it is intermittent. As regards the abdominal symptoms, constipation is frequent in the early stage ; later on, we find the loose yellow stools. The eruption is stated to be exceptional ; this, however, may be accounted for by the difficulty of seeing it in the dark skin.

Such has been the general course of the symptoms in the Punjab and North-West, but in Madras Elliott found the course much the same as in England. The temperature-record here was very characteristic. The tongue, pulse, faeces, and rash likewise were as usual. There was in addition a curious characteristic smell noticed.

ENTERIC FEVER IN EUROPEANS.

The course of enteric in Europeans in India may present the following differences from that occurring in temperate climates :—

(1) *Temperature*.—The classical chart of temperature in my experience has been but rarely seen. I can only recall two such charts. The fever presents no characteristic type ; it is often irregularly remittent, and may even assume an intermittent form. Murchison's dictum, that in any case of fever where the temperature approaches to normal during the first week the question of enteric can be excluded, does not in my experience hold good in India. The defervescence is very irregular, and the morning and evening temperatures may more closely approximate in the third week.

(2) *Diarrhœa*.—This is less, and often occurs only at a late period, in the third or fourth week.

(3) *Rash*.—This has been stated to occur less frequently. (In the recent war in South Africa it was also held to be present not more than once in five or six cases, except at Lombard's Kop, where it occurred very thickly.)

(4) *Tongue*.—The characteristic tongue in my experience is not often seen. (In South Africa extreme foulness of the mouth was noticed.)

(5) *Gurgling and Abdominal Tenderness*.—These are said to be less frequently observed.

(6) *Cardiac failure* is a frequent cause of death.

(7) *Thrombosis of the Large Veins* is said to occur more frequently.

DIAGNOSIS.

The general run of the temperature being so different to that observed in temperate climates, the fact that any present case may be one of enteric is not always apparent. But in

any case of "fever" uninfluenced by quinine after a week's trial of this remedy, the practitioner should always think of the following diseases in India : (1) hepatic abscess, (2) undulant fever, (3) enteric fever.

(1) As regards *hepatic abscess*, this may be one of the most easily diagnosable diseases, or, on the other hand, may be one of the most difficult. Cases occur in which there is no enlargement of the liver, and very little tenderness, and with a temperature not indicative of suppuration. Again, cases of enteric fever may occur in which the temperature may at first give rise to the suspicion of suppuration. The aspirator should clear up the case, and the liver should be aspirated in six places at least before coming to the conclusion that no pus exists. (2) *Undulant fever* is now known to occur in India, many cases having been reported. In this disease, in the malignant type we find a rapid invasion, the spleen enlarged, a constant high temperature, offensive stools, and the "typhoid" state supervening. In the undulatory type we have intermittent waves of more or less remittent pyrexia, of variable length, separated from one another by periods of abatement or absence of symptoms. Here the resemblance at first may be greater, as there is a preliminary period of malaise. There would be considerable difficulty in diagnosis during the first week ; after this period, however, the sedimentation-tests should denote which disease is present.

In the actual diagnosis of obscure cases of enteric fever the Widal test is invaluable. Is this test of equal avail in the tropics ? In answer to this question Dr. Brown, of Penang, in 100 cases of suspected typhoid, found only two instances in which the diagnosis given by the reaction was not confirmed, whilst in three cases that were not considered to be enteric at the time, the diagnosis obtained by the reaction was startlingly confirmed by the subsequent history of the illness. But in applying the test in the tropics, a great source of error lies in the formation of "false clumps." Now in the "true clumps," as occurring in the Widal test diagnostic of typhoid fever, the bacilli run together quickly, the field clears rapidly between the clumps, and the bacilli become motionless. The clumps are closely packed together, the bacilli appearing to adhere to one another in thick globular masses. "False clumps," on the

other hand, are more loosely united, the masses are not so dense, and are less globular. They retain their motility, though in a lessened degree. Lastly, they can be brought into focus under the microscope all at the same time, whereas the true clumps cannot. In applying this test in India, therefore, a virulent culture of the bacilli should be used, with a dilution of 1 in 10, and the limit for the action of the test must be a short one, fifteen minutes, and certainly not longer than twenty minutes.

The value of the "Diazo reaction" in enteric fever is perhaps chiefly negative. If no reaction be present, enteric can be excluded in the great majority of cases. A positive reaction has been found in cases of measles, malarial remittent fever, and rapidly-advancing tubercular disease, the two latter classes being diseases for which the diagnosis has chiefly to be made.

Lastly, as regards the blood-examination, Rogers has shown that in malarial fever we have an increase of the large un-nuclear corpuscles, whereas in enteric the increase occurs chiefly amongst the leucocytes.

TREATMENT.

Prophylactic.—Owing to the conditions of service in our army, it is impossible so to regulate matters that no soldier under 25 be landed in India. It is also too much to expect that the soldier should refrain from visiting the bazaars. I have never found it possible to exclude every particle of dust from one's bungalow during a dust-storm, nor can one ensure the total absence of flies. The matter of prevention, therefore, would appear to be an extremely difficult one. Professor Wright has, however, conferred on us an immense obligation, by his method of *inoculation*. According to the regulations for recruits, all must be properly vaccinated; and considering the great loss to our men in India from enteric, a similar order should be instituted that all men going to India should be inoculated. What is the evidence of the good effect to be derived from this practice? Taking the war in South Africa, the published statistics from Ladysmith, the Princess Christian Hospital, the Portland Hospital, the Scottish National Red Cross Hospital, the Kroonstadt Hospital, and Harrismith, all concur in showing a much less incidence on the inoculated than on the

uninoculated. As far as I have been able to gather, there was only one adverse opinion as to the benefit of inoculation—that of the late Dr. Washbourn. This opinion must carry great weight, but is somewhat inexplicable as contrasted with the results elsewhere gathered.

But everywhere inoculation seems to have been beneficial. Beginning with the Maidstone epidemic, where of 84 nurses and attendants inoculated not one was attacked, whilst of 120 nurses and attendants not inoculated 16 were seized with enteric, down to the statistical reports of the army in India for 1901 as published by Professor Wright,¹ in which it is shown that antityphoid inoculation diminished the incidence-rate of typhoid fever by one-half, and the death-rate by five-sixths, the great benefit of this prophylactic measure is amply demonstrated.

In barracks all water should be *filtered*. Sims Woodhead, as the result of his investigation on the different forms of filters, found the only efficient ones to be the Berkfeld and the Pasteur. The influence of the Pasteur filter in diminishing the ratio of enteric is undoubted. To take the French army, for instance : in 1886 there were 14 cases per 1,000 ; in 1894 the ratio had decreased to 0·6 per 1,000. As to which filter is preferable, Horrocks has shown that the enteric bacillus cannot pass through the Pasteur-Chamberland, but can grow through the candle of the Berkfeld filter in from four to eleven days, so that the former filter is the preferable form. If a Berkfeld be used, it should be sterilised every three days.

Parkes and Rideal state that the Bacillus typhosus is killed after five minutes' contact with *bisulphate of soda* in the proportion of 15·5 grains to the pint of water. Fifteen minutes' contact is more advantageous. Firth, however, states that 45 minutes' contact is necessary in order absolutely to sterilise the water. This method is of use where difficulties of adequate filtration arise in consequence of the candles getting obstructed by the large quantities of suspended matter.

Curative.—I do not propose to enter into the treatment of the various symptoms and complications of the disease, as they will doubtless be portrayed by others. In India, as elsewhere, good nursing is essential : unfortunately this skilled nursing is

¹ *British Medical Journal*, October 10, 1903.

not always available. Owing to the depressing nature of the hot weather, the season of the year when we find our enteric cases are most frequent, the patient must be regularly supplied with nutriment.

Milk is the food *par excellence*. Hale White, however, in an excellent lecture in the *Clinical Journal* has shown that milk is extremely deficient in carbohydrates, whilst it has too much fat. In fever the chief tissue to suffer is the proteid. Carbohydrate and fat will spare the proteid. But as no patient with fever can digest a quantity of fat, the amount of carbohydrate must be increased. This Dr. Hale White effects by giving half an ounce of maltine daily. This would, with three pints of milk, ensure the patient being supplied with the requisite number of calories per diem as shown in the following calculation. It is held that 2,000 calories of energy should be supplied by his food per diem. Now three pints of milk contain 1,350 calories, and if we give half an ounce of maltine in addition, we supply another 480 calories. The stools, of course, should be examined daily to see that the milk is digested. Should masses of curd be found in them, then the milk should be peptonised.

Alcohol.—According to my experience alcohol is more often required in India than at home, doubtless owing to the depressing nature of the hot climate. It should not, however, be given as a routine on this account, but only where the pulse-rate is above 110, where the extremities are cold and clammy, and especially where the first sound of the heart becomes obscure, with a dry tongue and muttering delirium. Here the alcohol must be pushed.

Drugs.—In 1896¹ I had the good fortune to read a paper by Dr. Simon, of Birmingham, on the antiseptic treatment of enteric fever. This physician, after an extensive trial of several drugs, following Wood of Philadelphia, came to the conclusion that oil of turpentine gave the best results. Since this paper appeared I have always ordered the drug (Ol. Terebenth, m. 15, Liq. Potassæ m. i.) in the cases under my charge. The good effect is at once evident; the strength of the pulse improves, whilst the stools lose their foetor, and any tendency to haemorrhage is restrained. The only

¹ *British Medical Journal*, March 21, 1896.

contra-indication to the exhibition of this remedy would be in cases in which albuminuria appeared.

A few words may be said concerning *urotropine*. Of late years the fact has become well known that the bacilli of enteric fever are present in large quantities in the urine, and persist far into convalescence. A patient should not be considered free from the chance of causing infection in others till all the bacilli have disappeared from the urine. The best means causing this is to prescribe urotropine in 7-grain doses thrice daily.

The "Woodbridge treatment," which claims to shorten and modify cases, and to be followed by no relapse, has been tried by Major A. G. Hendley, I.M.S., in India. Briefly the treatment is an intestinal antiseptic one, and consists in giving very frequently ("every 15 minutes during the wakeful portion of the first 48 hours") small doses of varying formulæ of podophyllin, calomel, guiacol carbonate, menthol, eucalyptol and thymol. Ptyalism is avoided by discontinuing the treatment for a couple of days, on the fourth or fifth day, when saturated solution of chlorate of potash in drachm-doses is given. The maximum number of doses in the 24 hours would be 96, but Dr. Hendley could not get his patients to take more than 70 doses. I should not particularly care to be the unfortunate patient, unceasingly drugged with this "mitrailleuse" medication. Dr. Hendley's results, however, were favourable.

Cardiac Failure.—Cases of enteric fever die more frequently in India from cardiac failure than in Europe. The physician attending a case should always be on the look-out for this complication, as evidenced by a progressively-feeble and dicrotic pulse, a progressively diminishing first sound of the heart, and an extension of the transverse cardiac dulness. The treatment should be by hypodermic injections of 5 minimis of Liq. strychniae over the heart. I well remember a case of an officer literally rescued from death by a young officer of the I.M.S. by this means.

Treatment of the Stools.—The most effectual method is to burn them with sawdust, or in an incinerator. Chemical disinfection is stated on the whole to be not so satisfactory, although Sinhuher of Konisberg found that enteric bacilli in faeces were speedily destroyed by quicklime. With a 4-per-cent.

admixture they perished in four hours ; with a 6-per-cent. in less than an hour, and with an 8-per-cent. within 15 minutes. He therefore prefers, as the best method, to treat the stools with 10 per cent. of quicklime with garden mould. Corrosive sublimate is also efficacious. M. Chantemesse found that in dilutions of 1 in 20,000 it destroyed the vitality of the enteric microbe, whilst 1-40 carbolic had no effect. The urine should be passed into receptacles containing 1-5000 solution ; the fæces should be similarly received, and the attendant directed to mix the disinfectant with the motion, and the latter should not be buried in the trench until it has been exposed to the action of the corrosive sublimate for half an hour.



TYPHOID FEVER IN CHINA.

By JAMES CANTLIE, M.B., C.M., F.R.C.S.,

Lecturer, London School of Tropical Medicine; Surgeon to the Seamen's Hospital Society; Consulting Surgeon to the Memorial Hospital, Hong Kong.

Nomenclature.—In the tropics, and in warm countries generally, the disease described as typhoid in Britain is usually termed enteric fever. The choice of names may mean nothing ; but on the other hand it may imply that enteric fever refers to a form of illness in which the condition known as the "typhoid state" is not marked or frequently absent. That such is the case is well known, for in China, at any rate, the signs and symptoms of typhoid fever are but rarely accompanied by the "typhoid state," and the disease would seem of a different, perhaps a milder, type than in Britain. The fact is that patients suffering from typhoid-fever infection in China seem less seriously ill than in Britain ; but withal the actual mortality is probably higher. The choice of the name enteric, therefore, has a clinical significance, for, although during the illness there are but few signs or symptoms of the intestine being involved, post-mortem evidence confirms the true nature of the disease.

Prevalence.—Were one asked to give a categorical statement of the prevalence of typhoid fever in China it would require to be in the negative phrase of yes and no. The disease would appear to be common amongst Europeans in certain cities in China, and scarcely met with in others ; and amongst the Chinese generally, typhoid is a rare complaint anywhere. We read, for instance, on the one hand, the report of the medical officer of health for Shanghai for the year 1900, in which he says : "Typhoid fever is at least ten times more prevalent in Shanghai than it is in England." On the other hand we may search many of the reports of hospitals for Chinese patients, under the management of Europeans in different parts of China, without finding a single case of the disease recorded.

The liability to contract typhoid in China would seem to depend upon whether we are considering the case of the

Europeans or the natives of China. All reports seem to point to the European as being liable to the disease, and in some places even to "ten times the extent" the disease prevails in Britain ; on the other hand, if observations are even approximately accurate, the Chinaman would seem to possess a certain degree of, at least, comparative immunity.

Absence of Statistics.—It is only in hospitals under European management, or in a British colony, where anything approaching to reliable statistics can be found in reports of diseases from China. In the Government Civil Hospital in Hong Kong the records of diseases are carefully kept, and the published reports are of real scientific value. In the General Hospital, Shanghai, the same holds good ; but from but few other hospitals, either on the coast or in the interior of China, have we any really accurate returns. A perusal of the Medical Missionary Society's reports, which are issued yearly, contains no information as to the diseases which actually afflict the Chinese. True, the reports give a tabulated list of operations performed, but no list of the general diseases. For this omission they are not in any way to be blamed ; for whilst the Chinese, when they are ill, will come as out-patients and get a bottle of medicine, they do not seek the hospitals when any ailment requiring prolonged medical treatment or confinement to bed attacks them. They have a certain belief in Western surgery, but their estimate of Western medicine is not of so high an order ; they, therefore, come for surgical treatment, but they prefer their own "doctors" for general ailments.

The information we have is, therefore, limited, and the statistics available are quite insufficient ; but allowing for the absence of exact information, it may be safely affirmed that the adult Chinese, at any rate, are as a rule seldom attacked by typhoid. It may be that the children acquire the disease in early years, and, surviving the attack, become more or less immune when adults ; but against this belief there is strong, or at least presumptive, evidence.

THEIR METHOD OF PREPARING FOOD PROTECTS THE CHINESE FROM TYPHOID.

Typhoid is ascribed to the contamination of food, be it water, milk, vegetables, &c. The wells are shallow, the proximity of

the wells to dwellings, to middens, to paddy (rice) fields or gardens watered by faecal fluid, would seem to justify the opinion that contamination must be rife. No doubt this is the case, but it does not follow that typhoid fever is a common ailment amongst them.

The Chinese seldom drink cold *water*; they boil their water and consume it in the form of tea. They drink tea at, or immediately after, a meal as we drink water, and a Chinaman even uses tea to rinse his mouth with after eating.

The other drink he indulges in is congee water, that is the water rice is boiled in. Here again it is boiled water he takes; so that the fluids he imbibes is boiled beforehand, and even should the water as he draws it from the well be contaminated, the chances of his drink causing typhoid are very remote, seeing that it is boiled.

Milk is another fluid by which typhoid is conveyed. The Chinaman, however, does not drink milk. He may take it in the form of curds after preparation; but even to his children he does not give milk. The child, if its mother cannot suckle it, is given congee water, and it seems to nourish the child as efficaciously as does milk.

Vegetables are also cooked before the Chinese eat them as a rule, so that whether it be the water, the milk, or the vegetables that are considered, the Chinese protect themselves against illness by boiling or cooking these forms of food. Such being the case, we would not expect typhoid fever to be prevalent amongst Chinese. As far as our information goes it is not common. How the methods of fertilisation followed by the Chinese is likely to infect vegetable produce is dealt with below.

HABITS OF EUROPEANS IN THE TROPICS.

When Europeans settle in any district the question of the water-supply receives immediate attention. When the community is a large one, extensive waterworks are, as a rule, established, and a good supply ensured. In Hong Kong an admirably pure supply is at hand; in Shanghai the water is brought from a reservoir, but its purity is a matter of some discussion. Amongst smaller communities the wells, such as they are, are guarded; but the water, seldom being above

suspicion, is usually boiled and then cooled before being consumed. In all probability it is more frequently by milk-contamination that typhoid, when it does appear, is conveyed. Europeans drink cow's milk, or buffalo's or goat's, if cow's cannot be had, and they take it, as a rule, unboiled. Vegetables grown by Chinese methods are apt to be contaminated with the sewage they use as a fertilising agent. Europeans frequently eat the vegetables raw, although no doubt after washing, and it is in all probability on account of the absence of typhoid germs in the faeces of the natives that the European is not attacked more frequently than he is, seeing that he partakes of salads freely.

Starting with these premises, one is better able to understand the prevalence of typhoid amongst certain groups of Europeans in China and the relative immunity enjoyed by the Chinese.

To begin with, some information can be gathered from a perusal of the Government health-reports, and more especially from the Civil Hospital reports in the colony of Hong Kong.

In the subsequent statistics the European population in Hong Kong is estimated at 5,000 persons and the native (Chinese) population at 220,000. Both of these figures are well within the actual numbers. Moreover many (about one-third) of the typhoid cases treated in the hospital are importations coming from ships calling at the port. It must be remembered also that the Chinese, except for surgical ailments, prefer to be treated by their own doctors; moreover, most Chinese when they become ill leave the colony for their homes on the mainland. With these provisos therefore, the figures must be taken as approximate only.

During the 10 years ending 1895 the number of deaths from typhoid in Hong Kong amounted amongst the Chinese community (220,000) to 38 in all, and during the same periods 44 deaths occurred amongst Europeans (5,000). We have no account during the 10 years in question of the actual number of cases of the disease. Subsequently to 1895 the statistics are more exact.

NUMBER of CASES of TYPHOID and DEATHS from TYPHOID occurring in Hong Kong during 1896—1897—1899, classified according to race.

Estimated population, Europeans, 5,000. Chinese 220,000.
Other Nationalities (numbers unascertainable).

Year.	Cases : Europeans.	Cases : Chinese.	Cases : other Nationalities.	Total Cases.	Deaths : Europeans.	Deaths : Chinese	Deaths : other Nationalities.	Total Deaths.
1896	25	9	3	37	7	6	1	14
1897	51	7	7	65	3	5	3	11
1898*	—	—	—	—	—	—	—	—
1899	36	17	6	59	11	15	1	27
	112	33	16	161	21	26	5	52

* Numbers unavailable.

NUMBER of CASES of TYPHOID and DEATHS from TYPHOID occurring in the Government Civil Hospital, Hong Kong, during 1900—1901—1902, classified according to race.

Year.	Cases : Europeans.	Cases : Chinese.	Cases : Other Nationalities.	Total Cases.	Deaths : Europeans.	Deaths : Chinese.	Deaths : Other Nationalities.	Total Deaths.
1900	21	6	3	30	7	2	1	10
1901	22	2	0	24	5	2	0	7
1902	21	8	5	34	2	6	0	8
	64	16	8	88	14	10	1	25

An average proportion of the number of cases and of deaths from typhoid amongst Europeans and Chinese (including other nationalities, Japanese and Indians), and taking the six years

ending 1902 (exclusive of 1898 for which no statistics are at hand), the cases and case mortality are as follows :—

Cases :—Chinese, 0·21 per 1,000.

Europeans, 36·4 per 1,000.

Case-Mortality :—Chinese, 57·45 per cent.

Europeans, 12·08 per cent.

It will be seen therefore that whilst Europeans are proportionately much more liable to typhoid in China than the natives of the country, the case-mortality of the Chinese is much higher. In Shanghai typhoid is much more prevalent amongst Europeans than in Hong Kong or in any British settlement in China. Taking the European population of Shanghai as about 5,000 (it was actually 4,684 in 1899 and 6,724 in 1900), the number of cases of typhoid during 1899 and 1900 amounted to 193, and the deaths to 19. That is to say, typhoid is more than three times more prevalent amongst Europeans in Shanghai than in Hong Kong, seeing that in the latter place there were but 176 cases in six years.

In other parts of China typhoid fever is evidently rare both amongst Europeans and natives. At Chunking (Szechuen), during the half-year ending October 31st, 1899, no typhoid ; at Chinkiang (Kiangtsu), for the half-year ending March 1900 ; at Soochow (Kiangtsu) no typhoid amongst Europeans, nine cases amongst well-to-do Chinese, none in the hospital ; at Ningpo (Chekiang), Hoihow, Kungchow and Pakhoi (Quang-tong) no cases of typhoid reported. In the report of the Peking Hospital of the London Missionary Society no cases of typhoid are noted during the year 1898. The cities herein enumerated include some of the most northerly and some of the most southerly in China, and whilst some are close to the seashore, others, such as Chungking, is some 1,800 miles inland. It will be seen also that were it not for the cases of typhoid amongst Europeans, but little would be heard of the disease in China. There are several reasons for regarding this immunity from typhoid amongst the Chinese as apparent only :—

(1) The reports by Missionary Hospital authorities are largely evangelical, and, even where they deal with medical subjects, it is chiefly to the branches of surgery and ophthalmology that prominence is given. (2) The difficulty of obtaining an even approximately correct diagnosis from Chinese descriptions

of the disease is almost insurmountable. (3) Typhoid fever is a much milder ailment in warm countries than in Britain, but evidently amongst Chinese much more fatal. (4) It is possible that the immunity of the adult is due to an extensive prevalence of the disease among Chinese children.

Several reasons might also be adduced in favour of the opinion that typhoid fever in China is uncommon amongst the Chinese. (1) In the Tung Wah Hospital in Hong Kong, a hospital for Chinese only, and where, including the in-patients, the out-patients, and the destitutes admitted, a total of 100,000 were dealt with in 1900, but 16 cases of enteric were registered. This, moreover, is the highest number of enterics admitted in recent years, for in 1901 and 1902 no cases of enteric fever were treated in the hospital. The Tung Wah Hospital has been under the control of British practitioners during these years, so that the diagnosis may be relied upon. (2) In the Government Civil Hospital, Hong Kong, there were treated for typhoid but 6 Chinese in 1900, 2 in 1901, and 8 in 1902. (3) The absence of the mention of typhoid fever in the hospital reports from many Chinese cities, where qualified British practitioners reside, is an additional testimony that the disease is not prevalent.

METHOD OF FERTILISING THE LAND.

The direct fertilisation of the land by sewage-materials, as practised in China, would seem at first sight to favour the idea that such a method is fraught with danger to the community. When one enquires into the subject, however, it is seen that the excreta are stored in cemented cess-pits, allowed to ferment, and it may be several months before the liquid manure which results is poured on the growing plants, be they rice-crops, garden vegetables, or young mulberry trees. The fermentation and bacterial growth has already taken place before the sewage is utilised, and we know in this country that the products of this fermentation may be allowed to flow over land or into our streams without danger to men or animals. It is just possible therefore that raw vegetables, even when fertilised after the Chinese method, may not be the means of spreading the disease, or at least not to the extent we are apt to assume.

That Chinese children do contract the disease was well illustrated in a Home in Hong Kong under European management in the year 1897. A German pastor came to the Home from the interior of China suffering from typhoid ; after his death six children, ranging from six to seventeen years of age, contracted the disease, showing that Chinese children are as liable, if not more liable, to typhoid than are European children of the same age. This case supplies food for argument in two directions :—First, it shows the liability of Chinese children to the disease and, therefore, that the apparent immunity of the adult is due to “child infection.” Second, seeing that Chinese children are so liable to the disease, the typhoid germ cannot be very prevalent in China, or more children would be found suffering from the disease.

The Type of the Disease.—So unpronounced were the symptoms of typhoid fever in the cases met with in Hong Kong by the writer, that there was always, until microscopic and serum-tests were practised, great difficulty in diagnosis. The distinction between typhoid and remittent attacks of malarial fever was so difficult that a compromise was adopted, and the ailment termed typho-malaria. Post-mortem examination occasionally cleared up the diagnosis. One case that came within the writer's experience will serve as an illustration. A young officer in the garrison of Hong Kong contracted an illness which failed to yield to quinine. He was seen during the third week of the illness by five medical men in consultation. Four of the five inclined to the opinion that the patient was not suffering from typhoid fever ; and but one of the five affirmed that the disease was typhoid. The man died, and conclusive proofs that the disease was typhoid were obtained post mortem. The patient's symptoms were not marked ; there was no diarrhoea until towards the end ; there was no rash, no marked tenderness in right iliac fossa, the tongue was not coated, and the temperature, probably owing to antipyretic drugs, was atypical. The diagnosis, that the symptoms were due to typhoid, before the days of microscopic and serum-tests, was founded really on the quinine-test, so that it came to be a rule that :—“ If after three days of treatment by full doses of quinine the fever showed no signs of abatement, in all probability the disease was typhoid.”

In China, as in India, especially amongst European children, fevers of precise duration occur which have not yet been classified. Seven-day fevers and fourteen-day fevers occur from time to time. The temperature rises suddenly, maintains a high register with but little remission and ends by crisis at the end of 7 or 14 days. The higher the temperature during the first three days, the greater the chance of the ailment ceasing on the 7th. Quinine is useless, and there are no signs of typhoid. The same disease is met with on the Californian coast, as well as in British Columbia, where the medical men assert that there is no malaria. What this fever is has yet to be determined, but that it belongs to the typhoidal group of ailments would seem probable.

The effects of the treatment of typhoid by European and Chinese methods can seldom be tested side by side ; but in the Tung Wah Hospital of Hong Kong the opportunity has arisen. Although the hospital is for Chinese, British and Chinese doctors are on the staff, and a patient may elect to place himself under either set of practitioners. In 1898, of two enteric patients under British practitioners, one died ; of five patients under Chinese doctors four died, and in 1900 of 16 cases treated by Chinese methods, 15 died. This is no doubt too meagre a number to justify a conclusion which is the better method of treatment ; but it serves to indicate a preference for European to the Chinese methods of treatment.

An important and instructive paper, entitled "Typhoid Fever amongst the Natives of Southern China," by J. Preston Maxwell, appeared in the *Journal of Tropical Medicine*, June 15, 1903. His conclusions are :—(1) That typhoid fever occurs sporadically (or may spread to the members of a household), but is unknown in epidemic form in China ; (2) Typhoid is uncommon amongst Chinese children (Maxwell met with no cases) ; (3) The symptoms of the disease conform generally with those met with in Europe, but as a rule they are less pronounced ; (4) Typhoid amongst the Chinese is attended by a not-insignificant death-rate.

SOME REFLECTIONS ON ENTERIC-FEVER INFECTION IN CAMPS.

By H. H. TOOTH, C.M.G., M.D., F.R.C.P.,

Assistant Physician, St. Bartholomew's Hospital; Physician to the Hospital for Paralysed and Epileptic, Queen's Square.

IT is scarcely possible to say anything about enteric fever in the army that has not already been said a great many times. Able articles by the officers of the Royal Army Medical Corps appear from year to year in the reports of the Army Medical Department dealing with the subject from every point of view. The importance of the water-question is recognised by all, and especial attention has been drawn to it by Dr. Leigh Canney and many other writers. In the present article it is proposed to give due significance to certain other aspects of the question of the origin and spread of enteric fever in camp, without losing sight for a moment of the absolute necessity for pure water.

The conditions of life in camp on active service are considered here rather than that of soldiers on the march, because the experience of the late war and of most authorities tends to show that troops in constant movement are much less liable to enteric fever than when encamped.

An encampment may be compared to a small town, and the health of the individuals will be subject to the same hygienic laws as govern the health of such a town, and the nearer to perfection the sanitation of the camp can be carried as a whole, the more perfect will be the health of the soldiers in it. This somewhat obvious truism must, however, be received with certain reservation. A military camp differs from a town in one fundamental particular: it consists of individuals of as nearly as possible the same age, and that age the most liable to infection of enteric fever. The vulnerability of troops to enteric fever may almost be compared with that of a large school to the exanthemata.

It is difficult to conceive a more healthy existence, on

theoretical grounds, for young and vigorous men than life in a well-organised camp. Why then do we have the monotonous experience of epidemics of enteric fever, such as was brought so prominently before the public in 1900, but which was only a repetition of less generally known experiences in the past in India and Egypt?

Let us be fully alive to the importance of the water-supply as a source of infection. This has been so repeatedly proved in civil practice that it is unnecessary to enforce its significance in the present connection. I have elsewhere urged¹ that the contaminated Riet and Modder Rivers were more than probably the initial cause of the preliminary epidemic in the Modder River Camp in February 1900, and that this outbreak was equally probably the parent of the still more disastrous epidemic among the troops when they encamped at Bloemfontein. The intervening events of Paardeberg must also be borne in mind. The question of the supply of pure water is one of cardinal importance, and is worth any trouble and expense. From a practical point of view it presents many great difficulties, which, possibly, may not be insurmountable, if the military and medical authorities work hand in hand.

A short reference to the state of affairs at Modder River may serve to give some idea of the magnitude of these difficulties. Practically the Modder and Riet Rivers were the only source of water-supply. Wells were sunk, but I am not aware that they came into general use, and there was a well at the Station Hotel, which was used by the headquarter staff. Possibly we may be overrating the rivers as a source of infection, but they were undoubtedly subject to contamination, and there was enteric fever at Jacobsdal, ten miles above. Now the problem is to supply, say, 50,000 thirsty men with pure water from the moment they arrive, heated with battle and a semi-tropical sun. They must lead their horses to the water, but must withstand the temptation to drink themselves. The proposed Water Company must either have in reserve a sufficient supply to meet this demand, or they must have been at the river long enough to have boiled and filtered enough for the purpose, manifestly impossible on the occasion referred to. It is this first drink that costs, and which may in a

¹ *Chm. Soc. Trans.*, Vol. XXXIV., 1901; and *A Civilian War Hospital*, 1901.

fortnight's time dot the camp over with cases of enteric fever, and so the foundation of an epidemic be laid.

Even if the Water Companies in the future prove able to meet the demand, a difficulty exists in the temperament and ignorance of the young soldier. I saw men belonging to regiments in which water was supplied boiled or filtered, or both, repeatedly drinking and filling their bottles from the river. Even if it were made a serious offence to drink from a tainted source, as it should be, it would be almost impossible to prevent it. It would appear that the only way to meet this aspect of the question is by the education and discipline of the soldier. He must be taught self-control, in a matter which, in his ignorance, he thinks trivial. This question is on all-fours with that of the emergency ration and the water-bottle on the march. Constant inspection is necessary to prevent the ordinary soldier from wantonly eating his emergency ration, and he will drink his water in the first hour of an arid march.

Allusion may here be made to another way in which a tainted river may infect men in spite of the utmost care in the matter of drinking water. Part of the daily routine of camp life at Modder River was the bath ; whole regiments of men were in the river at a time, and surely so salutary a practice could scarcely be interdicted. And yet it was carried out at large risks of infection. Even if a man were fully alive to the importance of not taking in any of the water, everybody knows that an involuntary gulp is a common incident during a swim.

There can be no doubt that the more perfect the supply of pure water, the more complete will be the elimination of *one source* of infection of an army in the field. In fact one is almost justified in saying that with such a water-supply an army might operate in a clean non-infected country with complete immunity from the disease. But is there such a country ?

It would appear that if there be, the British Army has not yet happened upon it. The supply of pure water is a question itself bristling with difficulties, and under the stress of war the most perfect mechanism is liable to break down with unfortunately terrible penalties. Suppose these difficulties to be surmounted, then one gate of infection may be said to be

closed, but unfortunately there are others wide open, and if anything more difficult to close, and of these the first to be reckoned with is the soil, not only that on which the camp may be pitched, but also that of the surrounding country. In a sandy, wind-swept plain the risks of infection are not confined to one area. Granted that the *Bacillus typhosus* can survive drying, then the repeated sand-storms to which these plains are subject will ensure the dissemination of the bacilli for long distances.

The series of events in the Orange River campaign which preceded the long wait at Modder River may be presumed to be fairly typical of such operations—a large force pursuing another, with a number of engagements, and in such a country the almost inevitable occupation by the pursuing force of the site of the late camp of the pursued, this site in both cases being determined probably by the line of railway and the water-supply. It is not too much to say that the pursued may leave behind on the soil an agent for disabling the pursuing force more deadly than the finest artillery.

Flies have repeatedly been credited with the carriage of infection, probably on their legs and bodies rather than in the alimentary canal. They have been alluded to by many writers, and lately by Major McCulloch¹ and Colonel Firth.² They were an ever-present pest in South Africa, and seemed particularly to haunt the unfortunate patients with enteric fever. The insect was indistinguishable from the ordinary house-fly. Dr. Poore³ gives due significance to the prodigious rate at which flies multiply under favourable circumstances. Dead horses, refuse of all kinds, horse-droppings, &c., form foci for the deposit of multitudes of ova which may hatch into flies in the course of three weeks, and Dr. Poore estimates the probable progeny of one female house-fly at 25,000,000 in the course of a summer. Probably flies find out an army, as the vulture the carrion, from afar, but the vast multiplication of these pests on the spot must to a certain extent be controllable in standing camps, by the prompt burial of all dead animals, refuse, &c. No doubt

¹ *Army Medical Report*, 1900, Vol. XLII.

² *Army Medical Report*, 1901, Vol. XLIII.

³ *The Earth in Relation to the Preservation and Destruction of Contagia*, 1902, p. 189.

also the presence of large numbers of horses in the vicinity of a camp favours the multiplication of flies of all kinds, the droppings being a favourable medium for the deposit of ova. In fact it seems almost an imperative duty to bury the excreta of horses as scrupulously as those of the men.

However the first cases among a body of men arise, whether that is by drinking-water, or infection from the soil, there can be no doubt that sand-storms and flies enter largely into the question of spread. No doubt the indefinite and widely variable invasion-period characteristic of the disease is a prime factor in this question. There are cases on which the most acute medically-trained intelligence cannot pronounce with certainty, taking no account of the so-called ambulant cases which may never come into the ken of the medical officer at all. But these cases are, many of them, capable of imparting infection, and the bacilli in their dejecta, and in some cases in their urine and expectoration, perhaps, may be carried about the camp by the sand-storms and flies. Before they have reported sick, or even before they know themselves to be ill, they may have unwittingly infected many of their comrades.

But there is reason to believe that a still more direct method of infection may exist arising out of the conditions of life in tents. The army bell-tent is made to accommodate twelve men, and where necessity arises, this number may be raised to fifteen or even more. The men dispose themselves radially with their feet towards the centre pole ; and though of course this arrangement provides the greatest distance possible between their heads, yet, with such a number per tent, they must sleep very close to each other, and must repeatedly during the night breathe each other's pulmonary exhalations. Supposing one of the twelve inhabitants of a tent to be suffering from undeclared enteric fever, the possibility of his directly infecting at least one of his comrades in the course of the indefinite invasion-period must be admitted by the most sceptical. The too frequent infection of nurses while in attendance upon enteric cases in the best-ordered hospitals, and in spite of every care on their own part, make it very probable that direct contamination by faeces or urine is not the only way in which contagia may be imparted. The important subject of overcrowding in tents has been alluded to by Col. Firth (*op. cit.*) ; he refers to

a report on a Typhoid Fever Epidemic in Volunteer Camps of the United States Army, 1898.¹ This report is a candid and most valuable document. The diagrams illustrating "comrade infection" in tents must be seen and studied to be appreciated; suffice it to say, that in a camp of 15th Minnesota Volunteer Infantry the incidence of the cases plotted out in plan of the tents indicates an infection communicated by man to man, whatever the original cause of the epidemic might be. If once the possibility of this method of infection be admitted, the question of ample tent-accommodation assumes an overwhelming importance. It is not a matter in which a civilian can be expected to speak with much weight, but on the little experience I have had myself, I should be inclined to say that twelve men to a tent is a great deal too many for the health of a camp, and that the number now allotted per tent in a field hospital, that is six, is much more nearly the ideal to aim at. Of course a suggestion like this will be regarded as Utopian, and there is no doubt that its realisation involves a great amount of extra expense and trouble, initial and transport.

The frequent removal of tents to fresh, clean ground is generally admitted to be essential to the health of the inhabitants. Not only does the soil covered by the tent become contaminated, but also that in the immediate vicinity, for the strictest rules will not prevent pollution by urination. The question is a complicated one, and probably of the same nature as that of the poisoning of the ground, familiar to the breeders of chickens and pheasants, necessitating the frequent alteration of site of the coops.

In conclusion, we may allude to certain conditions which may with reason be considered to have effect as predisposing to enteric fever. There seems to be little doubt that effluvia of all sorts have an effect on individuals of an unknown degree, but in the direction of predisposing to infection of all sorts. The influence of drain-exhalation on diphtheria-infection may be taken as an instance of this. It is surely more than fanciful to suggest that the wind-carried effluvia of dead horse, for instance, may profoundly influence the health of a camp.

¹ *Abstract of Report on the Origin and Spread of Typhoid Fever in U.S. Military Camps during the Spanish War of 1898.* By Majors Reed, Vaughan, and Shakespeare. Washington, 1900, p. 130.

Probably allied to this question of effluvia is that of ptomaine-poisoning. In an American volunteer camp some tainted meat was served out to a company of men, and in due course a severe outbreak of enteric fever appeared among them. It is not suggested that the tainted meat itself could have communicated the disease, but that it had acted as a predisposing factor.¹

Diarrhoea, or the gastro-intestinal trouble of which it is the symptom, almost certainly renders a man more susceptible to the enteric bacillus. A discussion on diarrhoea and its possible causes would be out of place here, but in all probability microbial infection is at the bottom of it. I have elsewhere suggested the similarity of the post-mortem appearances in the South African cases with those of the so-called "ulcerative colitis"² which sometimes appear epidemically in large lunatic asylums in this country and also periodically among the population at large. Careful observations on the genesis and distribution of diarrhoea in a large force in the field would be very interesting and instructive. It was so widely spread amongst the officers and men of the South African field force as to be almost universal, and accepted on all sides with stoicism as an unavoidable evil. I cannot help thinking that diarrhoea affords a delicate index of the sanitary state of the force, and more, that it is the stormy petrel of enteric fever, and that as such it requires the gravest attention of the sanitary authorities.

The foregoing reflections may serve to show how complicated the whole question of infection is. The officers of the Royal Army Medical Corps have, in the enteric-fever problem, a hydra to deal with, each head of which will tax their energies to the fullest. It is futile to throw all our strength into supplying pure water, organising a perfect latrine system, &c., if tents are to be overcrowded, and remain indefinitely upon the same site, and if refuse and dead animals are allowed to be the birthplace of innumerable flies. After all, the key to the problem is perfect general sanitation and no other. Even supposing that inoculation fulfils the expectations that it has

¹ Report on Outbreak of Typhoid in Camp at Jacksonville, by Lieut.-Col. L. M. Maus; Report of Surgeon-General of Army, 1898, p. 183.

² A Civilian War Hospital, p. 117.

aroused, it can never render perfect sanitation one whit less necessary.

The sanitation of camps in the future is to be entrusted to the care of an officer of the Royal Army Medical Corps, to be called the Sanitary Officer. His position in a large camp like that of the 6th Division at Bloemfontein in 1900, for instance, will be one of immense responsibility, and it is to be devoutly hoped that he will be carefully selected for the office, not only on the ground of seniority, and that he will be invested with powers sufficient to enable his recommendations to be carried out in every detail. It is fairly obvious that in the strict performance of his duty he will sooner or later come into antagonism with representatives of nearly every branch of the service. When a salutary measure is liable to be met by a commanding officer with a *non possumus*, "on the ground of military exigencies," it is evident that the sanitary officer will require all the tact and strength of character that he possesses, to say nothing of considerable special knowledge, to back his opinion.¹ There can be no doubt that the creation of this appointment will be appreciated by all who have the medical interests of the soldier at heart.

¹ There are some observations on page 180 of the American Report above mentioned on this question of the authority of Medical Officers in matters relating to the hygiene of camps.

CHANNELS OF TYPHOID INFECTION IN LONDON.

By GEORGE NEWMAN, M.D., F.R.S.E.,
Medical Officer of Health of the Metropolitan Borough of Finsbury.

IT is proposed in the present paper to gather together some scattered records with the object of casting light on the main channels of infection by which enteric fever is spread in the metropolis.

Speaking broadly, it may be said that two fundamental facts are accepted as the basis of enquiry :—First, that enteric fever occurs as a result of infection by the typhoid bacillus ; and secondly, that the typhoid bacillus leaves the body of the infected person through two chief channels, namely, the urinary and alimentary systems. It has been shown by bacteriologists that the typhoid bacillus is capable of a saprophytic existence in soil, dust, water, milk, and other natural media. Therefore it follows that the organism may pass from the body in urine or in faeces, and find its way into natural media, and from such media, sooner or later, back to man. The line of infection may be direct or indirect ; but that it occurs there can be no doubt. The question for consideration here is the more limited one, namely, the channels of infection in the spread of the disease ; and in order to confine the subject within a limited area the matter will be dealt with only as it has affected London during the last ten years. On the whole probably it will be found that the reports of the medical officers of health in the metropolis from 1893-1902 furnish the best evidence, in bulk, as to the sources of infection. It may be said at once that in the majority of instances of the disease a satisfactory case as to the channel of infection is not made out. We are left therefore to study the minority of cases, and see what general deductions can be drawn ; and it is unnecessary to say that such deductions, though founded on actual facts and findings, should be of a broad nature.

In passing it should be stated that during the last ten years the case-rate of enteric fever in London has remained fairly

constant, and works out at an average of 0·75 per 1,000 persons living.

The Royal Commission on Metropolitan Water Supply 1892-93 reported *inter alia* that a number of circumstances contributed to the comparative improbability of typhoid fever being contracted from the consumption of London water. Among these circumstances were the following:—(a) The alleged inability of the typhoid bacillus to live for long periods outside the body, and the fact that the bacillus produces no spores and is on that account non-resistant; (b) the enormous dilution of any infective pollution which may gain access to the water; (c) the germicidal or antagonistic action of light, low temperature, and vegetable organisms, which act in a manner prejudicial to the existence of the typhoid bacillus; (d) the fact that long rivers allow for some degree of purification; and (e) that by the "subsidence and filtration" treatment of the water-companies many bacteria, and presumably some or all of the pathogenic species, are removed. The advance of bacteriology during the ten years which have elapsed since this Commission reported has thrown a somewhat different light upon its findings, and it is probable that the immunity from typhoid fever enjoyed by consumers of London water is due to other reasons than those suggested above. Nevertheless, in a broad way, these conditions still exist, and doubtless play a part in freedom from the typhoid bacillus which is happily a character of the London water supply.

In 1894 a marked increase occurred in the notification of cases of enteric fever in London, which was most noticeable in the 49th, 50th, and 51st weeks, a time when in previous years the autumnal rise had declined. This abnormal prevalence may have been due to other causes, but it will be remembered that Mr. Shirley Murphy suggested that, owing to distribution and other characters, "the hypothesis of water-borne contagion appears better able than any other to afford explanation of the increase of the disease." But there was little direct evidence.¹

On three or four subsequent occasions between 1894 and 1903 it was suggested by various authorities that the recrudescences of typhoid fever which occasionally occurred were

¹ Annual Report of Medical Officer of Health of the Administrative County of London, 1894, p. 35, and Appendix II.

due to water-borne infection owing to pollution of the water-supply, fouling of cisterns, or temporary inefficiency of the filters. But not very much substantial evidence has been produced ; and it may be taken that as a general rule isolated or "sporadic" cases of the disease in which the channel of infection has remained untraced, do not denote water-borne infection. Substantial evidence of pollution of the water-supply in the first instance, and the subsequent occurrence of a number of attacks of the disease in persons who have consumed such polluted water, are necessary before water-borne infection can be considered proved. Now as far as the records in London go during the last few years, speaking generally, they furnish comparatively little evidence of such occurrences. It is not asserted that water-borne infection never occurs in London. It is suggested that it is by no means the commonest channel.

We are therefore led to look elsewhere for the chief channels of typhoid infection in London. Amongst a wonderful variety of suggested means of infection, two emerge, and year by year occupy a more prominent place in the records. The first is infection by contact with the persons or belongings of previous cases, and the second is infection by the conveyance of the virus in food, particularly shellfish.

I.—INFECTION BY CONTACT WITH PREVIOUS CASES.

The view usually held by writers on general medicine seems to be that this mode of conveyance is exceptional.¹ It will therefore be necessary to furnish some evidence in support of the view that it is not infrequently the cause of spread of the disease. It will of course be generally admitted that typhoid fever is not directly infectious in the same degree as, say, scarlet fever ; but that it is indirectly spread by way of infective excreta to healthy persons coming in the way of personal infection, will not, I think, be denied in the light of the following facts in respect to cases occurring in London during the last ten years.

In 1894 several of the metropolitan medical officers of health drew attention to the fact that typhoid infection was communicated from person to person under conditions where

¹ Fagge : *Principles and Practice of Medicine* (third edition) Vol. I., p. 160. Clifford Allbutt's *System of Medicine*, 1896, Vol. I., p. 804.

scrupulous cleanliness of management of previous cases was lacking. Dr. King Warry, the Medical Officer for Hackney, in his annual report for that year, proved that personal contact existed between a series of cases extending from September 1892 to May 1894, and which occurred in several houses in two streets. The facts were as follow :—

"The first cases of typhoid fever notified from Prince Edward's Road were those of Kate H. from No. 20, and Mary M. from No. 14, both notifications being received on the 5th September. The former was removed to hospital, the latter was nursed at home. Both of these girls worked at different places, and so far as could be ascertained the sources of contagion must have been different. The next cases were notified on the 14th September, viz., Annie S. from No. 68, and Emily K. from No. 22 ; the former was removed to hospital on the 23rd and the latter on the 14th September. The next cases notified were Charles M., Mrs. M., and Hannah M. from No. 14, all of them being members of the same family, as Mary M. was nursed at home. The cause of these secondary cases was no doubt due to the nursing at home of Mary M. ; for it was subsequently ascertained that Hannah slept in the same bed with Mary while she was ill, that Mrs. M. nursed Mary and attended to the rest of the family ; and Charles had free access to the room where Mary was lying ill. The next case to be notified was George S. from No. 70. He was immediately removed to the infirmary. On the 22nd, Philip H. of No. 28 and Charles J. H. of No. 16 were notified. These were both nursed at home under favourable conditions, and no further case occurred in these houses. On the 3rd October, Henry S. was notified, on the 20th October Clara S., and on the 21st Charles S. from the same address. The last three cases were no doubt secondary cases contracted from Annie S., removed to hospital on the 23rd September. Annie was nursed at home more than a week before removal, Clara sleeping in the same bed with her, and Charles and the father having free access to the room occupied by Annie."¹

¹ Report on Sanitary Condition of Hackney, 1894, p. 16. Dr. Warry made an enquiry into the sanitary condition of the houses, and any other likely source of infection, and arrived at the conclusion that all the secondary cases were due to infection by contact.

Similar cases were traced to personal contact in 1894 in Kensington and Southwark.

In 1898 in North Paddington two cases of enteric fever occurred in each of two houses, three cases in each of two houses, four cases in one house, and five cases in one house. In each of these sets of multiple cases the medical officer reported direct transference from patient to patient through neglect of all precautions. Several similar instances occurred in Hampstead, a group of ten cases in Hackney, a group of six cases in Shoreditch, and three in Lambeth were all attributed to personal contact with previous cases.¹

In a paper on the subject of the infectivity of enteric fever read before the Epidemiological Society in 1900, Dr. E. W. Goodall quoted the particulars of two series of outbreaks in London due to infection by contact with previous cases.²

The first cases quoted occurred in Lambeth in 1899, and involved thirteen patients. The second series quoted occurred in Shoreditch in 1898, and involved six cases. In 1899, Dr. Bryett, of Shoreditch, reported another fifteen cases in four groups as follows :—

“ During the year under consideration several enquiries have been made in instances where more than one case of enteric fever has occurred in the same house. In most of the houses in question, insanitary conditions of more or less gravity were found, nevertheless the histories of the cases afford grounds for believing that the first case which occurred was the source of infection in the cases which subsequently occurred in the house. It is not difficult to surmise how, under certain circumstances, the infection of enteric fever may be spread amongst the members of a household. Take the case of a family consisting of the parents and three or four children occupying a dwelling of two or three rooms ; one of the members becomes unwell, and gradually gets so ill that medical advice is at length sought, and the patient is pronounced to be suffering from enteric fever ; the patient has probably been ill for a week, a fortnight, or longer, suffering from the disease before the dangerous character of the disorder is realised ; no precautions have been taken during this period ; a mother, or sister, or daughter, as the case may be, has been waiting upon the sick one, besides

¹ *Transactions of the Epidemiological Society*, 1900, Vol. XIX., p. 169.

attending to household duties and looking after the wants of the other members of the family, preparing food, cutting bread and butter, and so forth, without disinfecting her hands ; or, as not infrequently happens, the patient has been sharing a bed with another member of the family. In the following series of cases the patients were all members of the same family :—

“(1) Annie B., aged 18, was observed to be ailing about the middle of July. She gradually became worse, and on August 1st was obliged to give up her work. It was thought that she was suffering from a very ‘bad cold.’ She kept her bed for about a week ; she lost her appetite, and suffered from diarrhoea, and is said to have been feverish. She was certified to be suffering from enteric fever on September 19th, and it does not appear that she was quite well until the end of September.

“(2) Louisa B., aged 16, sister of above patient. Her illness began about the middle of August ; she lost her appetite and suffered from diarrhoea and feverishness ; she did not keep her bed, and was quite well again by the end of September. This patient slept in the same bed as her sister Annie.

“(3) Mrs. B., aged 43, mother, was taken ill towards the end of August ; she was obliged to take to her bed on September 10th, and kept her bed from that date until October 7th.

“(4) Rosie B., aged five, sister, was taken ill during the first week in September ; she was seen by a medical man on September 15th, was certified to be suffering from enteric fever on September 19th, and kept her bed until October 7. This child slept in the same bed as her sisters Annie and Louisa during the greater part of the time they were ill.

“(5) Charles B., aged 38, father, became unwell about September 10th, was obliged to give up work at the end of that month, ‘sat about’ until October 7th, took to his bed until the end of October, and returned to his work on November 20th.

“The house in which the above cases occurred contains six rooms and a scullery ; its condition, from a sanitary point of view, was unsatisfactory. The inhabitants consisted of Mr. and Mrs. B., with their six children, who occupied four rooms, and a young married couple, who had two rooms. Three boys, aged 12, 10, and 7 respectively, remained well, as was also the case with the married couple. Although only two of the

foregoing cases were certified to be enteric fever, viz., 1 and 4, there is no doubt, from their histories, that the other three cases were cases of enteric fever.

" The following cases occurred at 105, P. Street :—

" (1) Charles M., aged 53, a wireworker by trade, was taken ill about the middle of June ; he kept at his work until the middle of July ; he suffered from diarrhoea. About July 15 he was obliged to give up his work and began to be delirious. He was certified to be suffering from enteric fever on July 18.

" (2) Alice M., aged 16, daughter of above patient, worked at the same place with her father ; she was taken ill about the middle of June, but continued at her work until July 17th. She suffered from diarrhoea, and was certified as suffering from continued fever (enteric ?) on July 18th.

" (3) Elizabeth M., aged 19, sister to Alice M., was taken ill during the first week in July, and was certified to be suffering from enteric fever on July 18. This patient slept in the same bed as her sister.

" No. 105, P. Street, apart from not being kept in as cleanly a condition as it might have been, had nothing markedly wrong with it from a sanitary point of view.

" The following cases occurred at No. 62, E. Road :—

" (1) Mrs. D. was taken ill about September 11, and was removed to St. Bartholomew's Hospital about September 25. She was not certified to be suffering from enteric fever. From enquiries subsequently made of this patient there is no doubt her illness was enteric fever.

" (2) Lizzie D., aged 13, daughter of above patient, was taken ill about October 1.

" (3) Florence D., aged 6, sister to Lizzie, was taken ill about October 2 or 3.

" (4) John D., aged 36, father, was taken ill on October 17.

Cases 2, 3, and 4 were certified as continued fever (enteric ?) on October 21.

" (5) George D., aged 8, son of above patient John D., was taken ill about the same time as his father, and was certified as suffering from continued fever (enteric ?) on October 23.

No. 62, E. Road is a house let off to several families, and

is in a very fair sanitary condition. The members of the afflicted family occupied one room.

"The following cases occurred at No. 100, W. Street, a house which is in a good sanitary condition :—

"(1) George E., aged 32, was taken ill about the middle of October. He was certified to be suffering from enteric fever on November 15.

"(2) Sarah E., aged 30, wife of above patient, slept in the same bed with him and waited upon him during his illness, was taken ill about November 1, and was certified to be suffering from enteric fever on November 15.

"In connection with the above cases, the length of time which may elapse between the commencement of the illness and the date on which it is certified to be enteric fever is very noticeable. It is a circumstance which is frequently observed in connection with enteric fever cases. Enteric fever is a disease usually very insidious in its onset, and medical advice is often-times not sought until the illness is well advanced. It is hardly necessary to reiterate, this is a circumstance which is very favourable to the chances of the disease affecting other members of a household, for until the nature of the disorder is recognised they are, so to speak, off their guard, and no precautions are taken."¹

In the same year Dr. Orme Dufield, of Kensington, reported a group of 12 cases, all apparently due to direct infection by contact. Dr. Sykes, of St. Pancras, reported an instance of 9 cases in a family of eleven persons, all due to personal infection, and 6 similar cases were recorded at Fulham. The particulars of the Kensington cases may be quoted :—

"The most serious outbreak of the disease in Kensington originated from cases occurring in Paddington in May and June. Some six households in the two parishes furnished 11 or 12 cases ; but with a single exception (Case 9), we had no knowledge of any of them until after removal to hospital or death. Two of the cases, the first and the last, were not notified, and some doubt was felt as to the character of the illness, though there was very strong suggestion, amounting to conviction, of typhoid in respect of the first case, which, in the subjoined account, will be taken as the initial case in the group. Of the

¹ *Report on Health of Shoreditch, 1899, pp. 19-22.*

12 cases four were young children, all of whom recovered, and eight were adults, six of whom died ; all save the first and the last cases.

“*Case 1.*—Minnie S., aged 31 years, wife of a painter, mother of four young children : occupied two kitchens in Paddington ; was described as of dirty habits, living under unwholesome conditions generally, and not particular as to quality of food. She fell ill at the end of May, was attended by Dr. M., and was laid up about one month, with symptoms indicative of typhoid ; but the case was not notified. She recovered, having been attended or visited during her illness by several of the persons who subsequently fell ill, in Paddington and in Kensington.

“*Case 2.*—Augustus S., aged 36, painter, husband of Case 1 ; fell ill on or about June 17 : case notified by Dr. M. as enteric fever June 22 : was removed to hospital June 23 and died on the 26th.

“ During this man’s illness, apparently on June 21, two of his children, Edith and Amy, were removed to a house in Blagrove Road in this parish, where Arthur R., their mother’s brother, with his wife and four children, occupied three rooms. After the death of her husband Mrs. S., with three children, removed to a house in Kensington Park Road, to share with her parents and an adult sister two rooms on the top floor.

“*Case 3.*—Edith S., 8 years—the first of the Kensington cases, but infected before arrival in the parish, fell ill at Blagrove Road, on or about July 5, and was sent to her mother (the widow of Case 2), at Kensington Park Road.

“*Case 4.*—Amy S., aged 6 years, fell ill on or about July 7, at the Kensington Park Road house. She and her sister Edith (Case 3) were attended, on July 12, by Dr. E. who, on 13th, notified both cases as ‘continued fever, probably typhoid.’ They were removed to hospital the same day. Both recovered.

“*Case 5.*—Arthur R., aged 7 years, cousin to Cases 3 and 4, fell ill at Blagrove Road, on or about July 11. He appears to have been seen for the first time by Dr. E., on July 18.

“*Case 6.*—Edith R., aged 5, sister to Case 5, fell ill at Blagrove Road on or about July 22, was first seen by Dr. E. on 26th, on which day he notified both cases (5 and 6) as

enteric fever, and they were removed to hospital on the 27th. Both recovered.

"Case 7.—Amy R., aged 23, aunt to the four children (whose washing she had done), and sister to Mrs. S. (Case 1) fell ill at Kensington Park Road, on or about July 19, was first seen on 22nd by Dr. G., who notified the case on 26th, on which day the patient died. The body was removed to the mortuary.

"Case 8.—Thomas S., aged 18, a railway porter, who with his mother and brother (absent from home at the time of his illness) occupied three rooms on the first floor in the Kensington Park Road house : fell ill on or about July 20 ; was first seen by Dr. C., on 27th, on which day the case was notified and removed to hospital. He died on August 18.

"Case 9.—Arthur R., aged 27, a painter, brother to Mrs. S. (Case 1) and Amy R. (Case 7) and father to two of the children (Cases 5 and 6), fell ill at Blagrove Road, on or about July 21, on which day he was seen by Dr. E., who notified the case on the 31st. The patient had visited Augustus S. (Case 2) in hospital, on the day of his death, June 26. But he probably contracted the disease from his niece, Edith S. (Case 3), or by visiting other sick relatives. He refused to go to hospital, and died August 18.

"Case 10.—Louisa R., aged 52, mother or grandmother to all of the previous sufferers, excepting Thomas S. (Case 8, who was not related to the family), Augustus S. (Case 2), being her son-in-law : fell ill towards the latter end of July ; the case was notified by Dr. G. on August 2. She was removed to hospital, and died on August 6.

"Case 11.—A Mrs. W., aged 44, living in Paddington, who had visited Mrs. S. (Case 1), and had been in frequent communication with other sufferers, fell ill on or about July 18 ; the case was notified, July 26 ; she died July 30.

"Case 12 (?).—On or about July 26, Mrs. T., Clydesdale Mews, who had nursed, more or less, all of the above cases, fell ill. She was attended by Dr. E., who, however, did not notify her illness, and therefore, of course, did not regard it as typhoid. But the nurse herself said her symptoms were similar to those observed in her patients, and, having been ill a month, she felt sure she had had 'the fever.'

"The origin of the illness of Mrs. S. (Case 1) is unknown ; the spread of the disease from person to person in the remaining cases (2 to 12) is clear enough. It was due in part, I believe, to direct infection. Enteric fever is not a highly infectious disease, like typhus for example ; but when it spreads from the sick person to the nurse or other person, it is usually owing to the want of cleanliness, and through the agency of the excreta, contaminating hands, &c., or getting into food. I had communications with the doctors in attendance on the sufferers, who attributed the spread to this cause, and to general neglect of necessary precautions, and disregard of the directions given by them. Dr. M., who attended Cases 1 and 2, said 'Mrs. S.'s illness looked like typhoid,' and he said he meant to report it, 'but the diarrhoea stopped.' He subsequently added that he did not at the first look upon the case as one of typhoid, but knowing what had happened since, he thought 'it must have been. Of course,' he continued, 'if the wife's case was one of typhoid, the husband might quite well have contracted the disease from her, for although he was warning them all the time, they slept in the same bed. The family were not cleanly, and probably drank out of the same dishes, although he warned them against all this.' Dr. E., who attended cases 3, 4, 5, 6, 9, and 12, stated that his view with respect to the spread of the disease amongst the children was, that the people, being poor and cramped for room, the parents, moreover, 'being uninstructed as to the danger, allowed the bed-clothes to get soiled with the excreta, which, having dried and become pulverised, contaminated their food.' Dr. C., who attended Case 8, and knew of the other cases, attributed the spread of infection to 'overcrowding and general carelessness in cleansing and disinfecting contaminated articles.' Dr. G.'s patient, Louisa R. (Case 10), had partaken of food left by her daughter Amy (Case 7), using the same dishes and utensils."¹

In my annual report for 1900 the following record occurs :—

"From the distribution of the cases of enteric fever there is some evidence to suppose that the actual causes are not common to the whole parish and do not continually operate. From a careful investigation of the cases brought to my notice

¹ Report on the Health of St. Mary Abbotts, Kensington, 1899, pp. 48-53.

from April 1900 up to the end of the year, I have formed the opinion that direct personal infection and infection through food are the two common channels for the propagation of enteric fever in this district. There is a disposition among medical men and others to regard enteric fever as 'only slightly infectious, if indeed it is infectious at all.' The disease is looked upon almost solely as a water-borne disease, and certain experiences in outbreaks in this country, in South Africa, and elsewhere, lend support to this view. London districts, where the water supply is excellent in quality and yet where enteric fever prevails, appear to furnish evidence that there are other agencies commonly at work besides water. I think in this district [Finsbury] there is ample evidence that direct contact with the person or belongings, of either a known or unrecognised case of typhoid fever, is one of the greatest factors in the spread of the disease. In support of this contention I may cite the following cases :—

" 1. Nelly Harp, aged 10, } were all notified as suffering
" 2. Minnie How, aged 14, } from enteric fever between
" 3. Annie N., aged 18, } October 20 and 22. They
had each been ill for some days previously, but they did not commence illness at the same time. They were members of three different families, but they were intimate friends and attended the same Sunday-school. Minute investigation in all three cases revealed no source of infection, except that it was fairly evident two of them had become infected by the first case.

" 4. Rose C., aged 9, was notified on November 3. She was a friend of Minnie How, and went to the same Sunday-school. She associated intimately with one or other of the three previous cases during the incubation period of their attacks.

" 5. Florrie H., aged 8, was ill during the first part of November and was nursed at home. The case was not notified as enteric at the time and no doctor was called in. The symptoms were those of enteric. Florrie H. was a 'great friend' of Rose C., and played with her up to the time of the latter's notification. She also attended the same Sunday-school as the previous cases, spending her playtime with Rose C. Florrie H. was nursed at home by her mother and

sister Ellen. She slept with her mother till November 24, and after that slept with her sister Annie. These first five patients lived in different houses and had nothing in common except their intimacy.

" 6. Mrs. H., aged 45, was notified as suffering from enteric on November 28. She was the mother of Florrie, and had helped to nurse her during her illness, and slept in the same bed with her till November 24, when Mrs. H. became ill, and went to sleep with her daughter Lottie. During the daytime Mrs. H. was out to work and Ellen nursed Florrie.

" 7. Ellen H., aged 22, took ill a day or two after the mother, and was notified on November 28. She had felt ill for some days, but struggled on with her work. Her attack proved a very severe one, and she died in hospital on December 15.

" 8. Henry G., aged 21, living in another district in London, was engaged to be married to one of Mrs. H.'s daughters. He spent his evenings very frequently at Mrs. H.'s house in Clerkenwell and was a general favourite in the family. During Florrie's illness he nursed her and would sit on her bed and amuse the child 'almost every evening.' He was very kind to her and they were 'great friends'. On December 1 he sickened, with what afterwards proved to be enteric. He was nursed at home.

" 9. Clara H., aged 18, sister of Ellen H., was notified on December 14 as suffering from enteric. She had helped to nurse both her mother and Ellen previously to her removal to hospital, and was ill at least two weeks before notification.

" 10. Lottie H., aged 20, sister of the above, was notified on December 14. She had slept with her mother and nursed her and Ellen previously to their removal to hospital. She was ill for seven days before notification.

" 11. Annie H., aged 13, sister of the above, became ill on December 13 and was notified with enteric on December 14, and removed with the other two sisters to hospital. She had assisted in nursing the previous cases and had slept in the same bed with Clara and Lottie about ten days before."¹

Here there are 11 cases all closely connected with each other, though living in six houses, and in all probability springing

¹ *Report on Health of Finsbury, 1900, p. 32.*

from one of the first three patients. After the first four cases, the disease went through a family of a mother and five daughters, each of whom had nursed the previous case in the family. The first cases were unrecognised and the subsequent cases though notified about the same time, were in different stages of the disease. The most thorough and careful investigation revealed no other likely source of infection beyond personal contact, or direct infection from soiled linen, bedclothes, &c. Moreover there is this instructive fact—from the commencement of the illness in the family (in which six cases occurred one after the other) up to November 26 there was no disinfection of excreta, linen, &c., but from that date onwards thorough disinfection was carried out.

In the same year Dr. Sykes, of St. Pancras, reported the occurrence of enteric fever in two households in St. Pancras, in one of which the first case was followed by six others, and in the second by nine others. In Battersea, Holborn, Paddington, Chelsea, and Shoreditch similar groups occurred in 1900.

In 1901 Dr. Orme Dudfield gave an account of eight cases occurring in three houses in Kensington, and due apparently to direct infection. In the same year Mr. Jackson, the Medical Officer of Health of Fulham, traced a series of fourteen cases to a previous case in the same house.

Dr. Allan, of the City of Westminster, traced 23 cases during 1902 to personal contact with previous cases.

Dr. King Warry, of Hackney, writes (1902) that :—

“Each year's experience strengthens my conviction that cases of typhoid fever should not be treated at home unless under special circumstances, with ample accommodation and the attendance of a trained nurse. During the year we have had several cases treated at home in poor families, and nursed by untrained relatives. Almost invariably secondary cases, usually the nurse, occur. In one instance we had four secondary from such a case. The lamentable point about these cases is, that the advice to be treated at home emanates usually from the medical attendant.”¹

Dr. Bryett, of Shoreditch, reports on the same subject :—²

¹ *Report on Sanitary Condition of Hackney, 1902*, p. 25.

² *Report on Health of Shoreditch, 1902*, p. 30.

" In previous reports I have remarked on the occurrence of cases of enteric fever in Shoreditch, in which there were strong reasons for believing that infection from patient to patient directly or indirectly was the chief factor in connection with their causation. The following series of cases which came under observation during the year may be recorded as further illustrations of the part played by personal infection in the spread of enteric fever :—

" (1) M. B., female, aged 5, residing at No. 8, U. Buildings, became ill about October 10. She was ill for six or seven weeks, and was considered to be suffering from consumption of the bowels. She gradually recovered and was practically well by December 3.

" (2) W. B., aged 13, brother to the above patient, was taken ill about November 13, and

" (3) E. B., aged 15, a sister, was taken ill about November 20. On December 3 the above cases were regarded by the medical attendant, as being enteric fever, and were certified accordingly.

" (4) W. B., aged 38, father of the above patients, a carman by occupation, was taken ill about November 17, and was certified to have enteric fever on December 15.

" The cases were all removed to hospital, but No. 1 was not retained, as she had recovered. Beyond a few slight defects in the drainage arrangements, the house in which the above cases occurred was in good condition sanitarily.

" The subjoined series of cases occurred at No. 58, C. Street, a house at which there is a small general shop. The premises were in a very fair sanitary condition, and nothing amiss was detected in connection with the drainage arrangements :—

" (1) E. P., aged 15, first showed signs of not being in her usual health about the second week in September. During the third week she was at Margate for five days for the benefit of her health, but her condition was worse on her return. She took to her bed on October 1, and died on October 16, her death being attributed to tuberculous ulceration of the intestines. She is stated to have been delirious during her illness and to have suffered from diarrhoea and sickness. She was nursed at home by her mother, and the father stated that she was kissed when dying by members of the family.

"(2) R. P., aged 7, sister of E. P., was ailing from about October 17, and was certified to have enteric fever on October 23.

"(3) C. P., aged 11, a brother, after ailing for a few days, was certified to have enteric fever on October 25.

"(4) E. P., aged 35, the mother of the family, was ailing from about October 16, and certified to have enteric fever on October 28.

"(5) E. M., aged 23, a married woman, and a relative of the P. family, residing at No. 24, H. Road, was taken ill about the middle of October, took to her bed on November 4, and was certified to have enteric fever on November 6. This patient helped in nursing Case (1), at No. 58, C. Street, and also in the housework there.

"(6) G. P., aged 36, father of the family, was taken ill about November 2, and was certified to have enteric fever on November 6.

"Two younger children belonging to the P. family were sent from No. 58, C. Street, to stay with some friends at Norwood early in November. As I was informed that they were not quite well when they were sent away from 58, C. Street, I communicated with Dr. Meredith Richards, the medical officer of health for Croydon. About a month later, however, Dr. Richards informed me that an inmate of the house at Norwood, at which the P. children had been staying, had been certified to be suffering from typhoid fever.

"With respect to the foregoing cases, I have no doubt that Case (1), although not certified as such, was in reality a severe case of enteric fever in which there was a good deal of diarrhoea; no precautions were taken such as should have been taken in connection with a severe case of enteric fever, and Cases 2, 3, 4, 5, and 6 resulted in consequence. Of the two younger children it is probable that the older of them had a slight attack of the disease, and was the source of infection in the case at the house in Norwood."

II.—INFECTION THROUGH CONTAMINATED SHELLFISH, ETC.

The type of food which may be taken to illustrate this point is shellfish of various kinds. It is, of course, well known

that to milk, ice-cream, and watercresses infection has on various occasions been attributed. But we have space only to deal with shellfish.

It has been known since 1894 that oysters and other shellfish may convey the infection of typhoid fever.¹ We have not space here to enter into a discussion on the scientific evidence of that fact, but it may now be generally accepted as proved. Turning to the metropolis, we find that it was in 1894 that there seemed to be in London districts increasing evidence of a relationship existing between the consumption of shellfish and enteric fever. It was not, however, of a reliable character, and Mr. Shirley F. Murphy, the medical officer for the administrative county of London, wrote as follows in his report for 1894 :—"The evidence which is supplied by the results of the inquiries made by metropolitan medical officers of health does not do more than establish the fact that antecedent to the occurrence of typhoid fever certain of the sufferers, and not in most cases a large percentage, had eaten oysters. There is no proof that the oysters in question had received infective contamination, nor is their source traced out except in a few cases. Further, there is no information as to the proportion of persons in the general population who had consumed similar oysters or shellfish of any kind." In 1895 further cases occurred apparently

¹ In 1880 Sir Charles Cameron suggested this possibility. In 1893 the late Sir Richard Thorne Thorne in his report on cholera in England further advanced the idea. In 1894 Dr. Newsholme, of Brighton, reported to his authority particulars of a number of cases of enteric fever apparently attributable to the consumption of polluted oysters, and at the end of the same year occurred the well-known outbreak at the Wesleyan University in Connecticut, reported by Conn. In the following year Sir William Broadbent described several similar cases, and Dr. Newsholme continued to follow the matter up, as indeed he has done up to the present time. He has shown that from 1893-1902 36 per cent. of all the cases of enteric fever at Brighton have been traceable to the consumption of sewage-polluted oysters. Evidence of a similar nature has been forthcoming from investigations by Bulstrode, Bruce Law, Buchanan, Theodore Thomson, Jaffé, Foulerton, Nash, Thresh, and others. The outbreaks at Winchester, Southampton, and Portsmouth are fresh in mind. Evidence from the bacteriological side became of a substantial nature in 1889 (Giaxa), and Foster, Fritag, Klein, Frankland, Boyce and Herdman, Cartwright Wood and others demonstrated that the bacilli of cholera and typhoid fever could persist in sea-water and in shellfish. *B. coli*, *B. enteritidis sporogenes*, and other allied species were found repeatedly in shellfish grown on sewage-polluted layings. In 1902-1903 Klein, Foulerton, Buchanan (Glasgow) and others proved this point in a very definite manner, and on at least three occasions *B. typhosus* itself (or an organism not to be differentiated from it) was isolated from cockles derived from polluted beds.

traceable to shellfish. In 1896 Dr. Timbrell Bulstrode's report appeared, and this naturally stimulated inquiry, which resulted in the following years (1897-1900) revealing a large number of cases apparently due to this cause. They all tell the same story, and therefore it will not be necessary to furnish extensive lists of cases. During 1901 and 1902 the autumnal rise of enteric in London was not marked, but increasing evidence was forthcoming as to the channel of infection in the cases which were notified. For brevity's sake, the returns for 1902, the latest available, will alone be referred to.

In Southwark in 1902 there were 193 cases of enteric notified, of which 28 (or 14 per cent.) were believed by Dr. Millson to be caused by the consumption of shellfish.

In Shoreditch Dr. Bryett traced 12 cases out of 149 notified to the consumption of shellfish from Southend. (The males aged 31, 16, 36, 21, 11, 15, 6, 28, 23, 15, and two females aged 29 and 28 respectively.)¹

At Poplar Mr. F. W. Alexander, the medical officer of health, reports² that 14 cases were directly traceable to the eating of shellfish.

In Woolwich 12 cases of enteric fever were reported as probably due to shellfish, and 12 also in Battersea. In Finsbury 10 cases were traced to consumption of shellfish.

In Wandsworth Dr. Caldwell Smith, the medical officer of health, reports that :—

"Of the total 139 cases notified, in 95 the cause of the disease could not be ascertained, in 11 it was contracted outside the borough, in 8 it was caused by infection from previous cases, in 3 it was presumably caused by the eating of watercress, and in 22 the patients had partaken of shellfish two or three weeks before the first symptoms appeared. Of the 22 cases due to eating shellfish 1 was presumably due to eating mussels, 1 to winkles, 6 to cockles, and 14 to oysters. A copy of the report made with reference to infection from eating cockles was sent to Dr. Collingridge, medical officer of health for the city of London, and he instituted inquiries, the result of which are contained in a special report made to the Corporation of London. The result of the bacteriological examinations

¹ *Report on Health of Shoreditch, 1902*, p. 29.

² *Report on Health of Poplar, 1902*, p. 48.

HISTORY OF CASES OF ENTERIC FEVER THOUGHT TO HAVE BEEN DUE TO THE EATING OF SHELLFISH.¹

Age.	Sex.	Date of Notification.	How long ill before Notification.	Interval between eating of Shellfish and onset of illness.	Kind of Shellfish eaten.	Where eaten.	Original source of Shellfish, if known.
41	M.	22 February, 1902	A few days	14 days	-	At home	Unknown.
23	M.	27 February, 1902	5 days	10 "	Mussels	Barrow in street	"
33	M.	13 April, 1902	4 "	12 "	Oysters	At home	"
25	M.	9 May, 1902	14 "	14 "	"	"	"
20	F.	1 July, 1902	A few days	Uncertain	Mussels	Barrow in street	"
17	M.	8 July, 1902	Several days	Rather more than a week	Whelks	Barrow in street	"
15	M.	9 July, 1902	"	About 14 days	"	"	"
14	M.	11 July, 1902	"	"	Crab	At home	"
25	F.	16 July, 1902	"	"	Cockles	Southend	Southend.
9	M.	23 July, 1902	"	"	"	"	"
16	M.	31 July, 1902	"	"	Oysters	Battersea	Uninown.
5	F.	5 August, 1902	A few days	14 days	Cockles	At home	"
26	M.	12 August, 1902	Several days	10 "	"	Southend	Southend.
12	M.	18 August, 1902	to 14 days	10 to 14 days	"	"	"
14	M.	18 August, 1902	"	"	"	"	"
16	M.	18 August, 1902	"	"	Crab	At home	"
38	F.	27 August, 1902	Several days	9 days	"	In a public-house	"
35	F.	3 September, 1902	A few days	About 14 days	Whelks	At home	"
28	F.	5 September, 1902	7 days	7 days	Mussels	Southend	Southend.
6	M.	10 September, 1902	About 14 days	14 "	Cockles	"	"
21	M.	24 September, 1902	3 days	12 "	Mussels	Barrow in street	Unknown.
37	F.	13 October, 1902	Several days	About 14 days	"	Commercial Road, Peckham	"
5	F.	17 October, 1902	"	11 days	"	At home	"
34	M.	21 October, 1902	A few days	10 "	Oysters	Blackpool	"
27	M.	21 October, 1902	"	10 "	"	At home	"
32	M.	28 October, 1902	About 14 days	10 to 14 days	Mussels	"	"
20	M.	21 November, 1902	Several days	11 days	Oysters	"	"
11	M.	11 December, 1902	A few days	14 "	"	"	"

¹ Annual Report of the Medical Officer of Health of Southwark, 1902, p. 35.

made by Dr. Klein show that most of the shellfish obtained in the Thames estuary contain bacilli similar to those existing in sewage, and in some instances bacilli resembling the typhoid bacilli were isolated. With regard to the causation of enteric fever from eating oysters, it has been a most difficult matter to trace the source of the oysters, as before being sold in this neighbourhood they frequently pass through the hands of two or three dealers. In only one of the cases were the oysters definitely traced to their source, viz.:—Emsworth. It was about the same period as the outbreak in Southampton due to

		Years.		
10 July, 1902	-	M.	7	Gurley Street - Cockles from Southend.
16 Aug.,	..	M.	57	Ford Street - Cockles from Southend.
29	"	M.	14	Canton Street - Cockles from Southend.
30	"	M.	19	Eglington Street Cockles from Southend.
5 Sept.,	..	M.	23	Lingen Street - Cockles from Southend.
10	"	M.	30	Cording Street Oysters, three weeks ago.
12	"	F.	21	Caxton Street - Cockles at Southend.
9	"	M.	35	East India Road Oysters, a month ago.
12	"	F.	20	Ford Road - Cockles at Southend.
18	"	F.	3	Tibbatts Road - Cockles from Southend.
18	"	F.	17	Tibbatts Road - Cockles from Southend.
18	"	M.	6	Tibbatts Road - Cockles from Southend.
18	"	M.	15	Tibbatts Road - Cockles from Southend
24	"	M.	11	Orwell Road - Cockles from Margate.

eating oysters from the same source. Of the 22 cases due to shellfish, 5 were fatal, 2 of those infected by cockles, 2 by oysters, and 1 by mussels. In a large proportion of the cases it was impossible to ascertain whether the patient had eaten shellfish, but personally I am of opinion that a considerable number of the untraced cases were due to this cause, as it is extremely difficult in cases which are removed to hospital to get definite information from the occupiers of the house."¹

Five cases occurred at Fulham, apparently traceable to the

¹ Report of the Medical Officer of Health for Wandsworth, 1902, p. 80. See also Dr. Bulstrode's Report to the Local Government Board, 1903 (May), p. 45.

consumption of oysters or cockles (at Ramsgate, Brighton, Southend, Littlehampton, Dublin, and London). A case of enteric at Chelsea was traced to shellfish from Southend (Parkes), and 1 at Greenwich to cockles at Leigh-on-Sea (Annis). Indeed 17 out of 67 cases at Greenwich (or 25 per cent.) were traced to fish or shellfish (*see* Table, p. 76).

During 1902 an outbreak occurred in the City of Westminster which was fully reported upon by Dr. Allan, the medical officer of health. Reporting in September of that year he wrote :—

"The marked decline which took place in enteric fever cases in London in August was not maintained, the cases rising from 287 to 473, a figure in excess of that recorded last year. In Westminster there have been no less than 26 cases, and the manner in which a number of these contracted the disease suggests a possible explanation of the increase in London generally. It will be observed that 14 of the cases were notified in the Wards of Covent Garden and Strand. Two other cases were notified at the end of the month subsequent to the date of this report, and I am informed that a case has also occurred in the borough of Holborn, and is connected with this group; a fourth case of bowel-complaint in a brother of one of the above patients came to my knowledge, but the medical men in attendance did not feel justified in notifying it as a case of typhoid fever. Two other notified cases also form part of this group, and a non-notified one in a married sister of a patient, both of whom had eaten cockles purchased in Southend and brought home by their mother. The sister was confined, and subsequent thereto had a high temperature for some time without any puerperal cause for it.

"All those attacked were young persons, and on enquiry it was elicited that all of them had been to Southend-on-Sea or Southwick (a small seaside village between Brighton and Worthing) for a fortnight. Of these 18 (Westminster) cases, 7 had been to the former place only, 1 to Southwick only, and 10 to both places. All those who went to Southend bought and ate cockles from itinerant vendors, and, with one exception (a boy who went to Southend also), those who went to Southwick picked up mussels and ate them—in some cases taking them to their lodgings to be cooked, but in a

FISH AND ENTERIC FEVER.¹

No. of Case.	Age.	Sex.	Date of Notification.	How long ill before notified.	Interval between eating and illness.	Kind of Fish eaten, and where.
1	8	F.	7 February, 1902	-	6 days	Mussels ; at home.
2	12	F.	2 May, 1902	-	11 "	" "
3	15	M.	13 June, 1902	-	12 "	Cockles, and fried fish ; at home.
4	14	M.	20 "	-	5 "	Shellfish (general) ; at home.
5	11	F.	23 "	-	13 "	Fried fish and cockles ; at home.
6	8	F.	1 September, 1902	-	6 "	Cockles ; at Leigh.
7	19	F.	11 "	-	9 "	" " "
8	9	F.	16 "	-	19 "	" Southend.
9	13	M.	16 "	-	19 "	" " "
10	12	M.	19 "	-	21 "	Mussels ; at home.
11	9	M.	21 "	-	20 "	Cockles ; at Southend.
12	17	M.	21 "	-	20 "	" High Street, Southend.
13	35	F.	22 "	-	8 "	Oysters ; at Southend.
14	18	M.	28 "	-	15 "	Fried fish and cockles ; at friend's house
15	36	M.	6 October, 1902	-	11 "	" " " home.
16	7	F.	25 "	-	12 "	Mussels ; at home.
17	26	F.	26 "	-	12 "	Cockles ; at Southend.

¹ Report on Health of Greenwich, 1902, p. 51.

good many instances the mussels were eaten raw. In the one exception, although the boy did not eat mussels at Southwick, he had eaten cockles at Southend, and the interval between so doing and falling ill was not too long to preclude the cockles as the source of the disease, but he had been constantly in the water bathing or paddling at Southwick, and had assisted other boys in collecting mussels. From enquiries I have made, there is no doubt that infection through the medium of infected shellfish might be contracted at both the places mentioned. The cockles sold at Southend came from Leigh, and I described in my Annual Report for 1901 the condition under which this industry is conducted, and the Jenner Institute was able to demonstrate in cockles brought from Leigh the presence of the bacillus which causes typhoid fever. Dr. Nash, the Medical Officer of Health of Southend, attributes cases in that borough to the same cause, and had ascertained that several cases of typhoid fever had occurred in the district supplying the sewage which falls into the creek, on the banks of which the cockles are laid. Dr. Nash informs me that steps are being taken to move the site of the cockle-layings to another part of the foreshore at Leigh where there is less chance of pollution.

"At Southwick and Shoreham a very imperfect effluent is turned into the estuary at a point near to which mussels are to be found in quantity (*see* Oyster Report by Dr. Timbrell Bulstrode). I learn that many cases of typhoid fever in neighbouring towns have been traced to shellfish from this source.

"It has been found that persons handling infected shellfish may convey the typhoid bacillus accidentally to their mouths, and so infect themselves, and it is therefore probable that children bathing or paddling in polluted water, or playing on a polluted foreshore, may similarly become infected.

"It is somewhat difficult to determine at which place each of the present group of patients became infected, as the period which elapses between receiving infection and the appearance of illness varies from a few days to several weeks—perhaps as many as five weeks—and the preliminary symptom being often merely a feeling of malaise, it is not easy to fix the date of its appearance. However, six of the children who had been to Southend only, took ill, so far as can be ascertained, within 18 days of their visit, three being at that limit, two at 13 days, and one at 10. In the case of the seventh patient

in this group, 36 days elapsed, but I found that his mother had been to Southend on a later date, and brought back a quantity of cockles with her, and he partook of them freely, and dating from that day would give 18 days as the incubation period. As none of these seven children had been to Southwick, they could not have been infected there. Of those who went to both places there are two divisions, as four of the ten were at Southwick for a fortnight ending three days before going to Southend for the day, and six went to Southwick two days after the Southend excursion. The length of the incubation period for the first four would be, dating from Southend, 9, 15, 18 and 18 days respectively, dating from Southwick, 12, 18, 21 and 21 at the earliest, 26, 32, 35, 35 days at the latest. They may thus have been infected at either place, and in support of the possibility of infection at Southwick at this period, viz., from the 2nd to the 16th August, is the case of the girl, R. D., who did not go to Southend, as she was not feeling well on her return from Southwick, and the incubation period in her case was therefore less than 16 days. The second division were at Southwick from the 21st August to 4th September. Two of this party took ill before their return, and two days after. The incubation periods of the six cases were, after Southend 14, 16, 18, 18, 27 and 31 days respectively; dating from 21st August, the first day at Southwick, 12, 14, 16, 16, 21 and 29 days, dating from the 4th September, 2, 2, 11 and 15 days for the last four of the group. It is therefore possible for the members of this group to have acquired infection at either place, and it might be that some of them were infected at one place and some at the other. I find that in 1897 a number of cases occurred after a day trip to Southend among children from this same district. It would be well for those responsible for excursions to seaside places to warn those in their charge of the danger they run in eating shellfish. This is done in some instances and I know of one large party of children who went to Southend about the same time as those mentioned above. None of the children were allowed to pick up or buy shellfish, and none subsequently suffered."¹

During the third quarter of 1902 an outbreak of enteric fever occurred at Southend and was traced to the eating of polluted

¹ Report on Health of City of Westminster, 1902.

cockles. Dr. Sykes of St. Pancras reports 11 cases in that Metropolitan district as part of the same series of cases.

This then is the chief evidence of the relationship apparently existing between the consumption of polluted shellfish and enteric fever. It is of course incomplete, and it is more than probable that some of the cases attributed to this cause were in fact due to other channels of infection. That the consumption of shellfish in enteric patients has been the channel of infection simply because they ate shellfish is of course an unjustifiable inference, and particular care should be taken, in tracing the channel of infection in such cases, to eliminate fallacies. But the broad fact of the general evidence remains. It only refers to London, and is confined to one year, but it includes more than 160 cases. It comes with cumulative force, and it comes in addition to similar evidence from all parts of the country and from the British Colonies and many foreign countries.

Nor must it be forgotten that recently cases of enteric fever have occurred in different Metropolitan districts in which it would appear that there is evidence leading to the idea that *fried fish* may convey enteric infection. The instances in which this was most carefully enquired into occurred in the Lambeth and Southwark districts, the investigation being made by Dr. W. H. Hamer.¹

Lastly, Dr. Michael Taylor of Penrith was the first to establish the now well-known fact that milk may, on occasion, act as a vehicle of the virus of enteric fever.² That was in 1857. Since that date more than 150 epidemics of this disease have been traced more or less completely to a polluted milk-supply. Schuder states that 17 per cent. of all typhoid epidemics are due to the consumption of infected milk. The steps in the process of infection are briefly as follow :—The excreta and the urine (in 25 per cent. of the cases)³ contain the germs of the disease. In the latter the bacilli may remain for weeks or months after convalescence. From these excretions the organisms may readily gain access to water and from water to milk ; or the excreta may become infective dust and pollute milk ; or persons suffering from ambulant typhoid may continue

¹ Ninth Annual Report of Medical Officer of Health of Administrative County of London, 1900, p. 37, and Appendix.

² Edin. Med. Jour., 1858, pp. 993-1004.

³ Gulstonian Lectures on Typhoid Fever, 1900. (Horton-Smith.)

to work in the milk-trade and so infect the milk. There are also other ways of indirect pollution of the milk. The most common way for milk to become infected by the typhoid bacillus is by infected water being added accidentally or wilfully to milk or used for "cleansing" milk-utensils (29 per cent. of the cases according to Schuder). But personal infection of the milk by typhoid patients or their nurses also plays a large part in spreading the disease through milk. Flies also may carry the germ to milk, as was evident in the Spanish-American War of 1898,¹ and the Boer War of 1900-1902.² Though the typhoid bacillus appears not to have the power of rapid multiplication in milk, it possesses the faculty of existing in milk for a considerable time (at least several days) even when milk has curdled or soured and may thus infect milk-products such as butter and cheese. Infection through such products may, however, be eliminated as of too rare occurrence to deserve attention. The bacillus does not coagulate milk like its ally *B. coli*, nor does it produce any apparent change in milk. It flourishes however at room-temperature as well as blood-heat in sterilised milk.

In London since 1894 there have been only two considerable outbreaks of typhoid fever traceable to an infected milk-supply (at Blackheath in 1894 and at Plumstead in 1895), and whilst it is evident that infection through this channel has been rare compared with infection through shellfish, it must not on that account be ignored, as owing to the absence of direct control of much of the milk which comes into London every day from the country a milk-borne epidemic may occur at any moment.

CONCLUSIONS.

If it be true, as would appear, that the case-rate for typhoid fever in London remains fairly constant year by year, and at the same time water-borne infection is not the chief channel, it seems reasonable to conclude from the above facts that personal contact and polluted food (especially shellfish) are the main channels of infection. In any event, a case seems to be made out for further enquiry on these two lines in any investigations into this disease, and for a study of the direction which preventive measures should take.

¹ American War Department, Official Report, 1900.

² *Brit. Med. Jour.*, 1901, i., 642 *et seq.*; and *Ibid.*, 1902, ii., pp. 936-941. (Firth and Horrocks).

AETIOLOGY AND PREVENTION OF ENTERIC FEVER.

BY H. E. LEIGH CANNEY, M.D. (LOND.).

I.—AETIOLOGY.

IT was not until the middle of the last century that typhoid and typhus fevers became generally recognised as entirely distinct and separate diseases. The century had opened with these two diseases inextricably confused, the confusion being the more marked by the inclusion of cases of other diseases clinically resembling them, and complicated by a most varied and extensive nomenclature based upon various prominent features, clinical, pathological or ætiological. The first three decades of this century were occupied in research largely devoted to establishing the anatomical aspects of the intestinal and other lesions, and the constancy of their association with typhoid affections. Much discussion was devoted by the French clinicians to the question whether typhoid fever was directly contagious in the same way as the acute exanthemata, the leading authorities holding that, if contagious, it was only so in a feeble degree. At the close of this period the ætiology was summed up by the distinguished Louis in the words "the most profound obscurity then reigns over the causes of the affection."

Though Hildenbrand (1810) had commenced the differentiation of the two diseases, it was not until the fourth and fifth decades of the century that the work was finally completed. Jenner (1849) practically laid the foundation of the ætiology of typhoid fever, by showing that the causation of typhoid fever must be specific ; he states : " I have expressed myself as if the specific cause respectively of typhoid fever, typhus fever, and relapsing fever was an influence emanating from the bodies of those affected with either disease," and he concludes " it would not have weakened the force of the facts adduced if I had regarded these diseases as non-contagious, because the question here considered is not how the individuals respectively got the disease, but if the same cause, whether contagion or

any other, can produce typhoid fever, typhus fever, and relapsing fever."

At the commencement of the seventh decade the ætiology of typhoid fever was summed up in the theory of putrid decomposition in the earth resulting in contamination of the air or occasionally of articles of food and drink, with special assistance of the vague factors, cold, fatigue, and emotion. This *putrefactive theory* Murchison now developed, his views largely influencing the later "air, soil, and water" theories. He pointed out that typhoid fever was not produced by over-crowding, and was only slightly spread by direct contagion, but chiefly by foul emanations from sewers and drains, and the pollution of drinking-water by organic matters. He held that the poison was produced by decomposing fæces, being not contained in the fresh excrement. Murchison materially advanced the knowledge of the ætiology of the disease, and his work formed the foundations for modern hygienic and sanitary measures.

The two rival theories, that of direct transmission, enunciated by Forget, and that of decomposition, were at this stage in frequent conflict. A decade later Budd brilliantly advanced the subject of the ætiology, and established views practically prevailing at the present day. His work led him to the following conclusion, viz., that typhoid fever cannot develop spontaneously; every case originates from some previous case. The typhoid poison, to him, was generated by the patient himself, adhering specially to the stools with which it was evacuated. It developed in the body of the patient, probably in the intestine itself, not, as Murchison had thought, outside the body. It was, to him, a specific agent with special activity, and probably organised and capable of growth and extension from a minimal dose. Budd thought that if means for rendering the infectious stools innocuous could be found, the spread of the disease might be prevented, and the disease possibly eradicated.

Difficulties, however, in the way of always tracing the contamination to a previous case, the occurrence of single cases, of endemics and epidemics, relationship of climate, season, and locality, led to the *localisation theory*. It was thought that the earth became the place of rest for, and

subsequent generation of, the typhoid poison ; that there it propagated, matured, and possibly passed through an intermediate stage. The theory of localisation was accentuated in the doctrine of Buhl and Pettenkofer, of the relation between the ground-water and the development of typhoid fever. By this theory, the higher the water-level, the lower was the mortality. Adherents of this theory retained the view of specificity and power of the poison to propagate, the poison being supposed to pass into the human body by the air, rarely through the water or other media.

Thus the view of a *living contagium* began to assume shape, followed by actual research, which culminated in the discovery by Eberth (1880) of the bacillus recognised to-day as the cause of typhoid fever, and the establishment, a little later, on a firm foundation, of its morphological and cultural characteristics.

THE BACILLUS TYPHOSUS.

It would be out of place to attempt here to review the whole mass of facts connected with the biology and morphology of the bacillus. I shall limit the subject to a consideration of those characteristics especially bearing upon the ætiology of endemic and epidemic typhoid fever. The rapid progress recently made in this subject, and the extensive series of tests and cultural characteristics to-day insisted upon before a bacillus can be accepted as the typhoid bacillus, renders it difficult often to accept the results of much research prior even to a year or two ago.

The typhoid bacillus belongs to the great "colon" group, but there is so far no evidence that either the ordinary *Bacillus coli communis* can be converted into the typhoid bacillus, or that the reverse is possible. The species are absolutely distinct.

The first factor of importance—a structural one—is that the typhoid bacillus is possessed of marked motility in fluids, which is effected by its being provided with eight to twelve long flagella, evidently adapting it more especially for life in fluid media. This particular structure does not, however, differentiate it with anything more than probability from bacilli resembling it in other respects.

Serum-test.—This test is only of real value, as a means of identification, if applied in a special way. Typhoid serum from an animal highly immunised against the typhoid bacillus is used. This serum is tested against the standard typhoid bacillus (agar-culture) and the highest dilution ascertained which gives the complete reaction in one hour. The suspected bacillus is now tested similarly. If both are equally sensitive to the serum, and both give a complete reaction in one hour in high dilutions (over 1 in 500), and both have given the other required tests, then both are specimens of the typhoid bacillus.

Pfeiffer's Test.—Should a bacillus give all the morphological and cultural tests of the typhoid bacillus, but fail partly to satisfy the preceding test, then Pfeiffer's test must be applied. This consists in injecting a ten-times-fatal dose of the suspected bacillus into the peritoneum of a guinea-pig and a very small quantity of typhoid serum from a highly immunised animal. If it is the typhoid bacillus, then the control animal injected only with the bacillus will die, but this animal will recover. The serum is specific ; it only protects, in minute doses, against the typhoid bacillus. If, therefore, the bacillus is not the typhoid bacillus, the animal will certainly die just like the control animal.

Research has shown that the human body may probably be regarded as the natural habitat of the bacillus in its most virulent form, and that though various media, such as soil, refuse, clothing, &c., may afford it a temporary means of existence, it avails itself of these latter media as saprophytic resting-places until it can gain once more access to some human mouth. Hitherto there is no proof that the typhoid bacillus can multiply outside the human body. The bacillus, moreover, has no spores or resting stage, and, therefore, if it once dies, it cannot be expected to reappear. Martin has shown that there is a strong antagonism between the bacteria proper to the soil and this bacillus ; that the latter is in fact destroyed by the products of the putrefactive bacteria.

Firth and Horrocks have shown recently that the bacillus is unable to grow in any direction in soil, though it may be recovered after 74 days ; that excessive moisture or great deficiency are the main factors affecting the chance of survival

in soil; and that from drying sand and from soil dried to dust the bacillus can be recovered up to the 25th day. In all except one of these experiments, both on soil and fabrics, strong emulsions of cultures of the bacillus were used. Only in one case was a typhoid stool alone employed, and in that experiment the bacilli could only be separated from the fabric on the 2nd and 9th days, though pieces were cut off and cultivated with the greatest care in sterile broth. We are still somewhat in the dark as to what happens when an enteric stool is placed on or in the soil without the addition of antiseptics. Karlinski has, however, recovered the bacillus in such conditions after three months.

A disease resembling typhoid fever is unknown in animals. Experiments with cultures given by the mouth or by intravenous injection have failed to give decisive results, though lately Remlinger seems to have demonstrated, in the case of rabbits and white rats, that typhoid fever can be communicated to animals by means of the typhoid bacillus. This latter fact, therefore, with that of the actual constant presence of the bacillus in the tissues of those suffering from the disease, from which it may be separated, grown in cultures, and made to reproduce the disease in animals, compel the conclusion that this bacillus is the cause of typhoid fever.

MODE OF CONVEYANCE.

Contagion.—The actual cause of the disease being demonstrated to be the specific bacillus, it becomes important to know if, and exactly how, the bacillus can pass from the patient to reproduce the disease in a healthy person. To define this clearly, it is essential to know where the bacilli are found in the body of the patient. The bacilli occur constantly in the mesenteric glands, the spleen and liver. The latter organ receives the bacillus first from the blood-stream; it is thence eliminated in the bile. The bile in the gall-bladder in the majority of cases containing the bacillus, often for a considerable time after the attack, with or without symptoms. This period may be prolonged even to fourteen years or more. The bacillus may remain dormant in the bone-marrow or the bile for years, and years after reappear in the pus of some bone-disease or cholecystitis. The bacillus

is, exceptionally, present in the kidney *post mortem*, though during life it may more frequently pass into the urine, in which it is present in one out of every four cases. It is found at any time in the course of the disease, more especially during the later stages, and in convalescence. Horton-Smith explains its presence as due to the rapid multiplication in the urine of a stray bacillus which has been passed through from the blood, where it always occurs at some time or other. It may remain in pure culture in the bladder for years. The bacillus always passes into the blood-stream, from which it is rapidly eliminated ; it occurs also in the rose-spots, and comparatively infrequently in the lungs. With regard to the excretions, there is no evidence to show that the bacilli can pass into the sweat. The cases where the expectoration can be regarded as infected are infrequent, but must not be overlooked.

The markedly contagious character of typhoid stools has been held strongly since the time of Budd. In the first fortnight, at least, of the attack these are intensely contagious. The bacilli become rarer later, or much more difficult to isolate, and hence possibly the fæces in the later stages and in convalescence may be less dangerous ; but the frequent escape of bacilli, long after the attack, from the gall-bladder leaves it essential that we must at present assume that the fæces of a person who has had typhoid fever recently are dangerous to the community. These cases may afford the explanation of certain epidemics arising under imperfect sanitary surroundings, where the impossibility of tracing the epidemic to a recent case has led to the assumption of the possible *de novo* origin of typhoid fever.

We have seen that former conceptions of typhoid fever as a purely intestinal disease must be greatly enlarged until we regard it as a modified form of septicæmia, the organism which is the actual cause of the disease always passing from the local and primary disease into the blood, and producing there the poisons which give rise to the various symptoms.

ACCESS OF THE BACILLUS TO THE BODY.

The digestive tract is probably the exclusive means of entry to the body. Mere presence in the vicinity of a typhoid case

is not sufficient to infect. The lungs and skin practically never can act as means of entry to the system.

Rarely the disease may be conveyed through particles of dust, more or less dried and driven by the wind, which find their way by the mouth to the digestive tract, passing, with very little damage to themselves, the acid contents of the stomach, to reach the more favourable conditions for growth existing in feebly-alkaline intestinal contents.

Typhoid infection may be conveyed by flies. Such a method would depend upon gross neglect of sanitation, involving the exposure of uncovered infected excreta. Flies can only give rise to sporadic cases, except, possibly, by one avenue, that is by infecting the water or other liquids with the typhoid material which they carry. Under ordinary attempts at sanitation flies practically could only become potent by carrying the infection to water and so distributing it.

Various conditions influence the vitality of the typhoid bacillus. The manner in which it may long find shelter in the human body assists in protecting from extinction a bacillus which cannot form spores and is otherwise so susceptible to destruction by means of air, light, water, drying, and especially to the toxines of the putrefactive and other bacilli. Whilst growing best at the temperature of the body, it can resist severe cold, even repeated freezing and thawing. Temperatures of 167° F. will kill in a few minutes, and sunlight acting for a few hours is fatal. It is comparatively resistant to drying, though in the case of some of the recent experiments of Firth and Horrocks the nightly fall of dew under the conditions of the experiments seems to have been disregarded. The main fact, however, is established that the bacilli may remain alive for months in fabrics more or less dry.

The vitality of the bacillus in water is of great importance since the danger of the conveyance of typhoid bacilli through the air is of quite minor importance. The difficulty of isolating the typhoid bacillus from typhoid stools, the destructive effect of light and drying on any bacilli driven by the wind from uncovered, carelessly exposed typhoid stools, the necessity for such bacilli finding their way actually into the mouth of the patient, all end to the conclusion that the danger is infinitesimal compared to the enormous risk from the

contamination of water-supplies either through rains or by the rarer event of wind-driven faecal matter.

In actual practice it is found that, when all the liquid avenues to communities available to the bacillus are closed, the agents at work limiting and destroying the bacillus in soil, refuse, clothing, &c., are so powerful that in such communities the epidemic rapidly resolves itself into sporadic cases, and then into total freedom for indefinite and long periods of time, until the introduction of a fresh supply of bacilli from an imported case.

In vast communities, densely packed, such as London, the former heavy incidence of typhoid had been reduced to very small limits, in spite of the fact that the water-avenues still remained open to the typhoid bacillus owing to imperfect filtration, by the companies supplying water from the rivers Thames and Lea (Corfield, Parkes and Rideal). This latter fact, taken in connection with the fact that under natural conditions comparatively few typhoid bacilli may find their way into water-supplies, necessitating large quantities of water being examined in order to detect them, and also in connection with the generally-accepted fact that the bacillus tends to disappear from unsterilised water in five to seven days, as a rule, unless the pollution is continuous, brings us to the conclusion that we must no longer regard as the test of a water-borne epidemic the fact that it is widespread and sudden in onset. Where the pollution is gross, such may be the case and often is ; nevertheless, water-borne typhoid may be sporadic, as in the case of the annual late rise in the London typhoid-incidence towards the end of the year, and in the case of Chichester and Dublin, though by a different mechanism.

Various conditions, chemical and physical, of river or other water may prolong the existence of the typhoid bacillus in unsterilised water even up to eighty days. In artificial carbonated and aerated water the typhoid bacillus may be found after days or even weeks.

THE RÔLE OF WATER AS A DISSEMINATOR OF THE DISEASE.

All authorities are agreed on the paramount importance of water under most varying conditions. Streams, springs, aqueducts, wells, reservoirs, cisterns, ponds, bilge-water, or taps

may become infected, either locally from the surface, or, in the case of wells, &c. by infection at deep levels through gravel, sand, or pervious soil, the bacilli being conveyed long distances, even under a mountain, from another water-supply. The various means by which water can become infected and then distribute typhoid fever are innumerable, such as the contamination of a river many miles away from the seat of the epidemic or in any part of its distribution, down to the local epidemic caused by a tap or a water-vessel being infected by the hand of a man conveying to it by direct contact the specific poison. Infected water also plays its part in milk-epidemics, in infecting salads or uncooked vegetables, bottles of medicine, a tooth-brush, or a paint-brush, on a sketching-expedition, subsequently placed in the mouth.

It has long been shown how the water of an apparently perfect mountain supply in "uninhabited" country may, through contamination by a passing native miles away, bring in its crystal clearness the fatal epidemic to a camp; whereas the crowded village or farm may have drunk for years from its sewage-contaminated wells or streams, without disaster, until the arrival of the specific bacillus.

With regard to the quality of a water, it must be recognised that, inasmuch as the true typhoid bacillus has only rarely been isolated from drinking-water, the microbes which are known to be commonly associated with it become the test of the purity or otherwise of the supply. The test of a water containing the typhoid poison is not the finding the bacillus necessarily, but the actual production of typhoid fever among the people who drink it. Hence no known chemical test or chemical examination of water can determine its potability, nor any mere enumeration of the bacilli present.

In addition to water, several liquid articles of food may convey the contagium. Milk is of especial importance. Typhoid fever has not been certainly demonstrated in animals: the avenue by means of milk is practically a water-avenue. The water-supply of a dairy being infected, it is easy to see how the milk may become infected by washing the utensils, or by the infected hands of an employé. Milk acting as an excellent culture-medium for the bacillus, it may serve as a wide distributor of typhoid fever. Not seldom the infection of

a milk-supply is caused by typhoid fever actually existing in the case of one of the employés, or of one of the persons who may subsequently handle the milk. In butter from an infected milk-supply the bacilli may persist many days ; also in the cheese.

Vegetables and salads may become infected either by infected soil contamination or by sewage watering, or in the same way as milk. Other articles of food may in the same manner become infected at the points of distribution (bread, pastry, &c.) The handling of shellfish infected by sewage containing the specific bacillus may lead to the contagium being conveyed to fried fish by the hands. Ice may be the means of conveying the bacilli.

Those engaged in nursing a case of typhoid fever may, if engaged in domestic work, also be the means, by careless disinfection, of spreading the contagium through the household.

It has been shown how typhoid bacilli may be transmitted in a more or less dry state, adhering to dust-particles through the air so as to enter by the mouth. More difficult, however, to accept is the supposition of the passage of typhoid bacilli through the air of pipes communicating at one end with a typhoid-infected cesspit and at the other with the overflow pipe of the drinking-water cistern. If this access to the cistern be possible, it would seem that the upward path of the bacillus must be through the sides of the cesspit to the lower end of the pipe, and then by the passage upwards of bubbles of infected water. That the air over such a cesspit contains the typhoid bacillus is not proved. Reported cases of typhoid fever due to open sewers or drains may be accounted for by infection through the hands or feet coming into contact with infected material scattered about. That the typhoid bacillus may subsist in soil at a considerable depth for months, through both the cold and hot season, is confirmed, though any considerable increase of growth or spread has not been shown. The main channel for the typhoid bacillus from subsoil is through pervious subsoils into the water-supplies, wells, &c., at some distance, as in the case of Chichester.

INDIVIDUAL SUSCEPTIBILITY.

Little is known of the individual bodily conditions which influence the development of the typhoid bacillus, or its failure

to develop when taken into the body. Certain external conditions influence the development of the poison, and its power to spread the disease—climate, season, and locality—all of which factors act chiefly on the bacillus outside the body.

Age.—The period from 15 to 35 is the age for the development of three-fourths of the cases. Half at least of the cases happen in the decade following the 15th year. After 50 an attack is unusual. It is rare in infancy and in old age.

Sex appears to have but slight influence. The slightly more marked incidence in men is to be explained by their more frequent change of residence, or by varied occupations leading to increased exposure.

The puerperal state appears to protect, though in the case of pregnancy and lactation there is less immunity observable. Infection of the foetus is not the rule, though under favouring conditions, such as infarcts in the placenta, it may take place.

Social Conditions.—Typhoid fever differs from typhus and relapsing fever in that it attacks well-nourished persons of the special age indicated above, in surroundings apparently hygienically favourable.

Occupation affects the incidence of typhoid fever, those likely to be in contact with the virus suffering most, such as physicians, nurses, laundresses, workmen in canals, sewers, and harbours.

Hospital Infection.—The spread of typhoid fever in a hospital from the infected to the uninfected may be either sporadic or almost epidemic. The infection is by contact with the excreta, and thence by food, drinks, utensils, &c. Its occurrence is to be regarded as an absolute indication of the sanitary conditions present and the organisation of the nursing and medical staff. Under the most trying conditions, such as during war (Mooi River Hospital, South Africa), it was possible to maintain a hospital, at one time containing 450 cases of enteric fever and many of dysentery, on the same site for eighteen months without a single case of enteric fever or dysentery resulting among the medical staff, civil surgeons, and nursing sisters. In Murchison's experience at the London Fever Hospital, long prior to the discovery of the bacillus and the use of antiseptics, during a period of 23 years, 5,988 cases were under treatment, and only 17 of the staff contracted

typhoid fever, most of whom had no personal communication with this class of cases, while 12 of the cases were during repairs of drainage. In well-conducted hospitals and institutions isolation of typhoid fever cases, though desirable, is not necessary.

Other conditions influence the onset of the disease. The existence of other acute specific infectious disease at the time of exposure to contagion seems to protect against typhoid fever; even during convalescence such protection may continue.

Patients suffering from chronic emaciating diseases seem to be partly exempt from attack. A former theory that errors of diet, with gastro-intestinal catarrh following, might cause typhoid is untenable. Such conditions may favour the onset and rapid development of the attack—at least the fact that relapses are often associated with errors in diet would lend support to this view.

Immunity.—One attack of typhoid fever confers some protection against a second, though in many cases this protection is not for life, and is less marked than in the case of most of the acute exanthemata. Two attacks are not uncommon, and the second may be equally severe; even 4 per cent. of all cases have been estimated to be second attacks. Three or four attacks are possible. It is uncertain whether any individuals possess a congenital immunity; such at any rate is very rare.

With regard to the immunity afforded by a first attack, it has been demonstrated that the blood-serum of convalescents from typhoid fever possesses the power of protecting inoculated animals (mice) against the effects produced by typhoid cultures, whether filtered or unfiltered; and the serum of these animals will immunise a second series of animals. It has also been shown that the blood-serum of those recently the subjects of typhoid fever contains specific "immune bodies," which are able to protect a guinea-pig from the effects of a typhoid culture injected into the abdominal cavity at the same time as a minute quantity of this serum. Such "immune bodies" are also produced in the blood of normal persons by an injection of dead typhoid bacilli of high virulence. A serum may be strongly agglutinative but without bactericidal properties, and *vice versa*. Therefore it cannot be stated that,

because a patient's serum agglutinates, it necessarily has bacteriolytic properties, and that the patient is protected against typhoid fever. At present there is no evidence that agglutination takes a share in producing immunity, though such is probably the case. An animal or person may be made absolutely immune without the blood ever having agglutinative properties. In typhoid fever the blood of the typhoid patient develops agglutinative properties. It also acquires bactericidal or bacteriolytic power, on which recovery depends. For the development of the latter power two bodies must be present : (a) a digestive ferment, the "complement," non-specific, present in minute quantities normally, and (b) a specific body, the "immune body" secreted chiefly from cells of the spleen, lymph-glands, and marrow on the invasion of the bacilli. This latter body has the power of bringing together the invading bacilli and the minute quantity of the digestive ferment (a), tending to the destruction of the bacilli.

A method of preventive inoculation based on the preceding observations has been proposed by Wright, and has been practised to a large extent in the army with promising results, the immunity being brought about by the development of the bactericidal properties in the blood and not by the production of antitoxines.

GEOGRAPHICAL DISTRIBUTION.

It is now established that any local predisposition to typhoid fever is to a quite minor degree dependent upon any supposed storing-up in the soil of the contagium, awaiting changes of water-level, season and temperature, in order to resume activity in the community. Such local predisposition is rather to be accounted for by some faulty conditions affecting the water-supply or surface-cleanliness of house-surroundings, which are more or less persistent in such locality. The community of such a locality only awaits the arrival of the contagium, either from a typhoid case or imported in food or liquid media, for it at once to find a rapid means of distribution, either by easy subsoil communication from well to well (Chichester); or by imperfect sewers contaminating the water-supply; or lastly through filthy surface-conditions around the tenements of the poor affording the contagium the temporary existence necessary

pending its carriage by flies or direct contact to liquid media or food.

The distribution of typhoid fever is practically world-wide, unlimited by sea-level or mountain height. It spreads from northern regions to the tropics. It can be carried from an infected spot to a place at a great distance previously immune, and there spread rapidly, if the local conditions are not altogether hostile to its known avenues of approach to man. All races are more or less subject to it.

Season.—Everywhere the increased frequency occurs during the late summer and autumn. It may persist into the winter. It is least marked in the spring. The causes of this relationship to season are unknown, but it would seem to indicate some general conditions responsible for the power of multiplication and vital activity of the bacillus itself.

Endemic and Epidemic.—Typhoid fever generally occurs in sporadic cases or groups of cases, house-epidemics, street-epidemics; in armies sometimes it occurs as single-tent or company epidemics. Sporadic cases may lead, through its most easy avenue of access to man—the water-supply—to town or city epidemics. Unlike cholera, typhus, or plague, it never spreads rapidly to near countries or through the world. This is accounted for by the fact that the bacillus is not easily conveyed through the air. It may be thus spread exceptionally, under conditions of gross sanitary neglect, as is the case in armies in the field, when the infected and the uninfected march and sleep close together. Even in such cases comparative immunity is obtained if the initial cases—the sporadic centres—are limited in their action, if only by the partial closure of the water-avenues to the bacillus, as was the case in the Abyssinian, Suakin and Ashanti campaigns.

SUMMARY.

Typhoid fever is then caused by the invasion of the human organism by the Eberth-Gaffky bacillus. The bacillus belongs to the great family of "colon" bacilli, but is sharply defined from *Bacillus coli communis*. The human body is the natural habitat of the bacillus in its virulent form, and though various media, such as soil, refuse, clothing, and possibly the air afford it a temporary means of existence, enabling it to cause sporadic

cases, yet the chances of its disappearance from a community are very great, if its wide diffusion in its human host in epidemic form is prevented by protection of the liquid avenues, especially the water-supply, from contamination.

The growth of the typhoid bacillus takes place in the body of the typhoid patient practically exclusively. It is discharged with the intestinal and urinary excretions, and gains access to another individual through the mouth and stomach. Entry through the air-passages is quite exceptional.

Typhoid fever is not a "contagious" disease in the usual sense of the word. It is conveyed from the patient and his dejecta directly through contact in the ways indicated. It does not need to pass through a state of maturation and development outside the body.

The principal avenue of access is water. Dissemination in the dry state as dust-particles through the air is possible, but not common; and if the water and liquid avenues to a community are protected, epidemics are impossible, the disease disappearing after a diminishing series of sporadic cases. The theory that typhoid fever may result from the inhalation of putrid gases must be abandoned. If placed on or in the soil, it will remain for some time at this spot, and will not grow in any direction, though it may be carried by accident into water-supplies, subsoil water, and wells, and so be spread. The theory of localisation in soils leading to local predisposition must be abandoned, as also the view that the poison may be exhaled from the soil in the ground-air. Typhoid fever tends to confine itself to house- or street-epidemics. It is widely distributed, no race or country being quite exempt. Early adolescence greatly favours its development. One attack protects in a large majority of instances, though two attacks are not uncommon.

II.—PREVENTION.

We are now in a position to review the measures necessary to prevent the spread of typhoid fever (1) throughout a community or district and (2) from the individual sufferer to those in immediate contact with him.

To Budd it seemed possible that by the destruction of the infectious power of the intestinal excreta the disease would be extinguished. We now know that, to arrive at such a result at

all rapidly, we should have to institute other measures, adapted to close avenues now known to be available to the bacillus, and also to prevent the possible dissemination of the bacillus by the patient for years after his recovery.

Hitherto, although there has been an enormous reduction in the incidence of the disease by suitable measures of sanitation, as regards drainage and water-supply, practically no city or community of any considerable dimensions has yet succeeded in abolishing the disease from their midst. Though the extinction of typhoid fever from civilised communities will doubtless finally be attained, the methods by which this result will be reached will necessitate far more precision in the details of preventive methods and more carefully-trained attention to the methods of sterilisation of infected excreta, protection of water-supplies, filtration of water, sterilisation of suspected water, and organised plans to limit the possible danger arising from the long persistence of the bacillus in the bodies of those recovered from the disease.

On what grounds are we justified in supposing that more elaborate detail and care as regards sanitation will enable us to attain within a reasonable time the end in view—the total extinction of this disease from the community, from neighbouring communities, and finally from the civilised world? The grounds for this conclusion are as follows:—

(a) The growth, development, and spread of the bacillus, as the potent cause of the disease, are practically limited to the human body.

(b) The saprophytic existence of the bacillus in various media, fluids, organic refuse, soil, &c., is so short and precarious that with ordinary attempts at sanitation, such as are at present the rule in cities such as Paris, London, Munich, the incidence of the disease is enormously reduced, in spite of the fact that the avenues by water are still open occasionally to the population, owing to defects in filtration-technique allowing a certain proportion of the immensely-diluted typhoid contagion to reach individual consumers in a sporadic manner, and although other means of access by imported cases, contact, infected articles of food and clothing are also only imperfectly protected.

(c) The fact that, when once a community is free from the disease for a short time, it will, even in the presence of gross

sanitary defects, remain free indefinitely, or till such time as the bacillus is imported into the community.

(d) Where sections of the community are limited, as in prisons (Millbank, Pentonville, Pietermaritzburg in South Africa), in the case of some military and hospital camps towards the close of the late war, and in civil camps as at the Assouan Barrage Works, to the use of protected water only, and are under ordinary careful sanitary administration, these sections of the community remain free, though in proximity to communities not so protected and, in some of the cases referred to, intensely affected by the incidence of the disease. The saprophytic existence of the bacillus in close proximity to the section of the community so protected is unable effectively to spread the disease either by flies, dust or air, in this protected section. The disease in epidemic form is no longer possible, and even sporadic cases are rare. There is no known instance of a community, civil or military, having thoroughly protected itself against all the water-avenues open to the typhoid bacillus, suffering from anything but sporadic cases. There is, as yet, no known instance in war or military camps, where the water-avenues and other avenues available to the bacillus have been all closed in the sense in which they will later come to be regarded as closed (that is, by the supervision of trained men, and an accepted technique); and yet practical extinction of the disease has occasionally resulted from incomplete efforts at prevention.

Attempts have been made to trace the causation of typhoid fever in vast military camps (Bloemfontein, Kronstadt, United States of America Volunteer camps) absolutely destitute of any organised plan of sanitation, and equally devoid of any means of dealing with the epidemic, in consequence of allowing every avenue of the bacillus to be unguarded. It is not from such places and under such conditions that any useful conclusions can be obtained. Such disasters only serve as a sharp lesson, both to the peoples and to the armies concerned, as to how easy it is to fall back from the organised methods of civil life into chaos, by neglecting the practical value of established scientific facts and practice. Effectively to estimate the potency of any particular avenue of typhoid to man, it is essential that all other avenues must be rigidly closed at the time; without

this all conclusions drawn from such observations are mere assumptions and valueless as data.

Typhoid fever then is a preventable disease. The extent to which it is prevented depends upon the intelligent action of the community, and may be regarded as an index of the extent of progress any community has made.

We will now discuss the measures generally desirable to limit or prevent the spread of the disease, and then some proposals for the more effective prevention, if not the abolition, of the disease.

Water.—By far the most important initial step is the securing an abundant and protected water-supply. However elaborate may be the general sanitary methods in force, they are practically useless as barriers to the spread of the disease if the water-supply is subject to excretal contamination. It is important that there should be only one supply. The use of a supply either infected or subject to infection, used for purposes of cleansing, bathing, and washing, along with a protected supply for drinking-purposes, presents the gravest difficulties.

Drinking-water, to be potable, must pass the bacteriological test of containing no living organism that can be considered of recent excretal origin. To condemn a water, it is not necessary to demonstrate the presence of the typhoid bacillus ; the presence of the microbes known to be commonly associated with this becomes the test of its purity. To secure this quality, it becomes necessary to protect the intake, the collecting-ground, or the river itself, from the possibility of contamination by either excreta, refuse, or sewage. Pipes and conduits must be tested carefully as to position and fittings, to avoid possible infection from sewers in the vicinity. The process of filtration should be carefully devised to avoid the fallacies to which filtration is often subject. The water must be protected onwards to cisterns, to house-storage, and to the very taps, not a few groups of cases having been traced to peripheral contamination by the hand. Steps must be taken to prevent any upward passage of bacilli from infected cesspits along the moist surfaces of the cistern overflow-pipe. Should the water-supply be under suspicion of infection, there is no known method of filtration, as at present practised, that can render such water absolutely safe. It is to be rendered safe by boiling.

and kept from flies and dust in sterilised covered vessels. Artificial mineral waters can only be rendered safe by using boiled or condensed water in their manufacture, bottles and corks being sterilised by steam or boiling-water. The bacillus has been separated from soda-water frequently in India. In countries such as India or South Africa, where the distribution of water liable to infection is general, all mineral-water factories should be allowed to sell only fluids so protected and bearing the state mark.

In the case of wells, these should be deep, protected in the upper part by masonry walls from contamination by water from the superficial layers of the soil and from the surface. It has been demonstrated that the bacillus may, in pervious sand or gravel-subsoil, be conveyed long distances either from other wells or from deep-soil contamination.

In the case of springs, the water should be conveyed upwards in impervious tubes to the spot where it is required, thus avoiding contamination *en route* or at the surface.

Care should be taken to prevent men recently recovered from typhoid fever from being engaged on works connected with water-supply.

An intermittent water-supply has been shown to be a cause of typhoid fever by suction of infected material into the water-supply pipes through defective fittings. Precautions must be taken in carrying water-supplies in the neighbourhood of cemeteries, the bacillus having been isolated from the body three months after death. The bodies of dead animals may also contain the specific bacillus, and contaminate water-supplies.

The ways by which infected water may be the means of spreading typhoid fever are numerous, and must be carefully watched. The washing of salads, &c., or of utensils (especially milk-vessels), the watering of gardens or fields containing green food for animals or man which may be subsequently handled by him, the water for toilet purposes, for the dispensing of medicines, the making of ice, ice-creams, and the sale of shellfish must all be observed.

Next in importance is the regulation of the disposal of sewage and of refuse. The maintenance of absolute cleanliness around dwellings or camps is essential, to prevent even the

temporary saprophytic existence of the bacillus. Too often, around the dwellings of the poor, the possible contamination of refuse with actual typhoid excreta is possible. Not only excreta, but refuse water, must be provided for, and access of either through pervious cesspits, middens, or gutters to defective water-arrangements must be prevented. Everything must be done to make any leakage or connection between sewage-pipes and water-supply impossible. Typhoid fever is rare on sewage-farms, and therefore, if properly carried out, these are a satisfactory method of sewage-disposal.

Fluids used as foods and certain food-stuffs require consideration, either from the possibility of contamination in the course of production or distribution by infected water, or by actual contact with excretal matter from some person engaged in the business, either suffering from typhoid fever or being in attendance on such a case. These articles include (1) milk, and articles derived from it, butter, cheese, &c. ; (2) fruits, salads ; (3) fish (ready-cooked), shellfish.

Business premises for the production or distribution of these articles, such as dairies, fruit- and fish-shops, and restaurants, require much closer supervision than at present is the case. Instances could easily be quoted illustrating the spread of typhoid fever by each of the above varied means of dissemination.

A community or camp prepared to meet invasion by all of the above routes will be free from typhoid fever ; but for some time to come such a community may and will find itself troubled by the actual presence of individuals suffering, or recently recovered, from this disease, acquired in a locality where the sanitation is at a lower standard.

How are such imported cases to be dealt with, to prevent these individuals acting as foci for the distribution of the disease ? In the dwellings of the poor, with small rooms, overcrowding, and sanitary conditions offering to the bacillus a shelter till its access to fluid media shall ensure its spread, it becomes imperative to isolate the patient in a hospital or special home, or else to carry out a series of regulations with special care. The patient must be separated from the rest of the household, only short visits, without direct contact, being allowed. Trained nurses must be supplied, the sick-room well-

ventilated and kept quiet, all unnecessary articles or hangings, carpets, or unwashable furniture being removed. The nurses must realise that they may carry the poison excreted by the bowels and bladder on their hands, to infect foodstuffs, utensils, &c. intended for their own use or that of other members of the household. A separate set of utensils is to be provided. The dejections are to be received into glass or glazed bed-pans containing a carbonic-acid solution, milk of lime, or perchloride-of-mercury solution, and left some time for thorough disinfection. The closet, woodwork, and receiver must be thoroughly disinfected. The bed-pan or urinal should be washed throughout in a solution of perchloride of mercury, of lysol, or of carbolic acid, and allowed to dry. Urine may be treated with perchloride of mercury (HgCl_2) for 10 minutes or more. In hospitals, camps, or large institutions boiling is the best means of destruction for both faeces and urine. The hands of the nurse are to be carefully disinfected regularly, especially before meals, in a similar manner to that practised by surgeons. The patient's hands, anus and perineal region will be washed personally or by the nurse with a suitable antiseptic solution. The physicians and nurses should be provided with washable clothing. In hospitals the nurses should not attend other cases. In schools, barracks, &c., cases should be isolated at once, at the earliest moment. In armies this is so essential that suspicious cases—cases of headache or diarrhoea with a temperature, from no known cause—should be instantly isolated, and if proved to be typhoid they should take no further part in the war. The bodies of those dead from typhoid should be enveloped in sheets or cloths saturated with carbolic acid or perchloride-of-mercury solution. The use of urotropine as an agent preventing the continued urinary infection is advisable in the latter stages of the disease. The sputum, washing-water, bath-water, food-remnants, utensils and clothing of the patient all require disinfection. On recovery the patient's room should be disinfected with (1) formalin-vapour for walls, ceiling, furniture, &c.; (2) carbolic solution for woodwork, floors, cracks, &c.; (3) boiling, steam sterilisation, or burning for all bedding, &c.

Inoculation.—What part can inoculation take in prevention? The special field for preventive inoculation, as introduced by

Wright, is in the case of large bodies of men, such as armies, about to be exposed to the action of the virus unless sweeping sanitary reforms are introduced. So far, no decisive figures have been obtained owing to the imperfect or unsatisfactory manner in which the experiment of inoculation, and the recording and publishing of the results, have been practised in the army, though a markedly diminished incidence and death-rate are claimed. The protection is only partial, and therefore inoculation cannot release the individual, or community, or army from practising the complete sanitary indications above detailed, which, though more laborious, have yet the certain promise of success, in preventing not only the disease in question, but at the same time various other diseases disastrous to communities and camps.

We have seen how typhoid fever is a preventable disease, and how it has for some years now been largely prevented and brought more or less to a standstill at a certain level of continued incidence. Is it possible to reduce at a more rapid rate, or to abolish entirely, this residuum? From a consideration of all the facts known, we must conclude that such is possible. There is no epidemic or endemic disease, except cholera, which can be more easily controlled and prevented than typhoid fever. Instances can be given where it was long supposed to be endemic, and where it is so no longer, although the preventive methods in force were not so elaborate and rigid as must be regarded as essential now. Insurance statistics have shown that after a war, though in a distant country, the home-coming army, though convalescent, will produce results in the home community as disastrous as the ravages of this disease had been in the war. The diffusion of the disease over a large population, perhaps extending over one, two, or three years, makes, however, less impression on the imagination of the country. Apart from war, in times of peace, the same importation from place to place, and country to country, of new foci of the disease is going on. A certain proportion of cases, during and long after convalescence, are able to carry about with them, even for years, the contagion of the disease. It is these imported cases, and these groups of cases caused by convalescents, which must be considered. We would propose:—

- (1) That every community or district should regard it

as a duty to insist upon every case of typhoid fever being attended throughout, if at home, by at least two nurses specially trained and certificated for the care of such cases, in order to insure complete sterilisation of all excreta and limitation of the disease. Such a step would rapidly lead to a great reduction in the number of cases, and be a great saving to the country. The nurses should be supplied wholly or partly at the public expense.

(2) Where there is any chance of strict attention to nursing-rules not being enforced, and where, in consequence, either through overcrowding or bad sanitary surroundings, the disease is likely to spread to others, such cases should be isolated in hospitals or homes.

(3) The routine administration of urotropine towards the close of the illness should be regarded as essential for some days. No patient should be regarded as finally free from nursing-care and from the need of continuance of the technique of sterilisation of excreta, &c., until the temperature has been normal for a fortnight, and the certified absence of the bacilli from the urine has been furnished to the local authorities.

(4) Similar rules should be carried out in the army, and the absence of the bacillus from the urine of every soldier leaving hospital or returning home from service abroad, who has been the subject of typhoid fever, should be certified by the sanitary officers of the army. Numerous instances have occurred where soldiers long convalescent from typhoid fever, on returning home, have by accident contaminated the surface near a well or water-supply, and thus infected a whole household.

Finally, a word may be added on the prevention of typhoid fever (and the associated diseases, dysentery and cholera) in armies in the field. So certain are these preventable evils in war under existing arrangements, and so disastrous are their effects to the efficiency of the army and to its power of rapid movement, rendering *hors de combat* four times the number who suffer from the enemy's fire, that the question of prevention becomes a problem of the greatest strategic importance. In July, 1901, the author proposed a scheme to meet these evils. It was obvious from the first that the rapid service of approved or safe water must be the basis of any scheme of prevention ; without this all other steps would be futile.

To provide sterile water in war so rapidly that practically the army's movements were not delayed, however large that army might be, seemed at first a Herculean task. As the result, however, of experiments, it was shown that, with the addition of one mule per 100 men, two special rapid (nine minutes) sterilisers, with all the meat-extract, tea, sugar, and fuel (three-fifths of an ounce of petroleum per man per day) required to sterilise and supply all the fluids needed by these 100 men for two or three days, could be easily and conveniently carried. It was shown that this would lead, with other proper sanitary precautions, to an immense reduction of the transport, and would vastly increase the army's efficiency and comfort, relieve the stress placed upon the R.A.M.C., and allow their attention to be concentrated upon the wounded. In addition, it would render it not only possible, but desirable, to advance into the enemy's country in the face of epidemics of typhoid fever (cholera and dysentery). When first proposed, this scheme was regarded by the War Office (House of Commons, 17 Aug. 1901) as "entirely impracticable for active service." However, the unanimous feeling of practicability expressed by a large meeting of military experts at the author's lecture before the Royal United Service Institution, and by the military and lay press, led to its actual adoption a few months later, the conclusion of the war alone preventing the actual putting of the scheme into practice. The Secretary of State for War declared (May 6, 1902), "a scheme for providing safe water to fill the soldiers' water-bottles at all times has been prepared, and measures are being taken to carry this out." All that now remains is that the scheme shall become an integral part of army organisation.

The details of this scheme in their essential points will be found in other places.¹

It is sufficient to state here that the principles upon which the scheme is based are :—

(1) The intelligent trained co-operation of every man and officer in the practice of, and adherence to, the details absolutely essential to success.

(2) Provision for the service of "approved" or sterile water,

¹ *Journal Royal United Service Inst.*, December, 1901; *Med. Soc. of London*, October 27, 1902; *United Service Magazine*, October, 1903.

being as continuous and as rapid as is the service of ammunition or artillery. This is attained by "water-section" men, 2 per cent. of the strength being specially trained in technique by the special sanitary officers to divisions, recently appointed. These "water-section" men then pass, when certified, under the direct and absolute control of officers of units. In war, at manœuvres, and on foreign stations, the "water-section" men must prepare or approve all fluids drunk by the army in and out of camp.

(3) All non-medical officers to be trained in the same technique and methods of prevention by the R.A.M.C. special sanitary officers, and to be held absolutely responsible for the occurrence of typhoid fever (cholera and dysentery) in their units ; sanitary success in the army being periodically recognised by promotion or distinction.

(4) Institution of a "pioneer-section" trained and officered in a similar manner, distinct from the "water-section" and differing in being combatant ; their duties being the maintenance of camp cleanliness, latrines, &c. They will, under the officers of units, act as police and see that every man, after being trained in his duty to the camp and to his comrades, observes the rules laid down.

Under this scheme the officers of the R.A.M.C. in their sanitary branch are responsible for the training of all officers and men in the technique necessary to prevent these diseases ; the responsibility for its being carried out obviously devolves upon the officers of units. The R.A.M.C. act in the first place as instructors, then as advisors, whenever their advice is sought, and finally as recorders of the success attained or the reverse, noting the responsibility for any outbreaks of these diseases. The proper consideration of the recommendations for distinction made by the R.A.M.C. being of vital importance to the army.

That such a scheme is practicable, and vital to success and efficiency, has been demonstrated now in every point. That it is urgently needed is admitted by all who have considered the subject. There is every reason to believe that the Army Medical Advisory Board, upon whom the responsibility rests, will without delay assist the army to know that typhoid fever is a preventable disease.



RIGORS IN TYPHOID FEVER APART FROM ANY RECOGNISABLE COMPLICATION.

By CHARLES BOLTON, M.D., B.Sc., M.R.C.P.,

Assistant Physician to the North-Eastern Hospital for Children.

THE occurrence of Rigors in Typhoid Fever, apart from any recognisable complication, is by no means an uncommon event, and many instances of this alarming variation in the temperature-curve can be found on looking up the reports of any large hospital. We have recently had a case of this description at University College Hospital, which, on account of the number of the rigors and of their great and unusual severity, is well worth recording. I have, therefore, by the kind permission of Dr. Sidney Martin, under whose care the patient was, taken the opportunity of using it as the basis for a paper on this subject, and at the same time of collecting together all the literature relating to it which I have been able to find. Dr. E. W. Goodall, of the Eastern Fever Hospital, has very kindly supplied me with four of the references.

The patient was a nurse in University Hospital, aged 24 years, and her illness commenced on December 4, 1902, with pains in the head and limbs, and a "cold in the head." She was warded on the fifth day of the disease. On admission there was slight abdominal distension, the spleen was just palpable during inspiration, and the tongue was moist and coated. The lungs and heart were normal.

A slight vaginal discharge was present, the pulse 102, and the temperature 103.6° . There was very severe headache, which was relieved by 10 grains of phenacetin, the temperature falling to 99.6° as a result. This was the only occasion on which phenacetin was given.

From the following day till the nineteenth day of the disease there was retention of urine, necessitating the passage of a catheter. The urine was throughout the illness quite normal, with the exception of a cloud of albumen which was present during the first three weeks of the disease, after which it

disappeared. The vaginal discharge, which was a simple leucorrhœa, disappeared in the course of a few days. On the seventh day of the disease the typhoid serum-reaction gave a positive result. Spots first appeared on the abdomen on the tenth day. Until the eighteenth day the temperature-curve had the characteristic features seen in typhoid fever at this period, the upper limit being about 104° , and on this day it was elevated by a degree, at 11 p.m. being 105.2° .

During the first eighteen days the fever had been treated by tepid sponging and wet packs at 70° . The bowels were at first constipated, necessitating the use of enemata, but on the fourteenth day diarrhoea commenced.

The mental condition was normal until the sixteenth day, when delirium first manifested itself. The frequency of the pulse was on the average about 104 to 112 , and on six occasions only was it over 120 , the highest record being 124 .

Up to the present time the case had presented the appearance of a severe attack of typhoid fever, but on the nineteenth day the temperature-curve was interrupted by a rigor which proved to be the first of a series of twenty-one. The first rigor began at 10 a.m. whilst the patient was having an attack of diarrhoea in which several dark blood-clots were passed. There was severe shivering at the onset; the countenance was pinched and livid; the pulse became 148 in frequency, very weak and irregular, and the axillary temperature registered 107.4° . In half an hour the temperature had fallen to 104.8° , and the pulse mounted to 160 , being in the same condition as before. An infusion of 17 ounces of normal saline solution was, therefore, administered subcutaneously. The pulse remained at 148 for two and a half hours until the temperature had fallen to 100° , when it sank to 136 . Later on the pulse-frequency was 128 ; and at 9 p.m. it was so weak and irregular that a pint of normal saline solution was again injected under the skin, this treatment being followed by a great improvement in the pulse. There was occasional delirium during the day, and the left leg seemed to be a trifle swollen, but there was no oedema. The heart was quite normal, and there was a little bronchial catarrh.

From the nineteenth to the twenty-first day inclusive the first five rigors occurred, each having the same characters as the

first, above described, and usually occurring whilst the patient was having an attack of diarrhoea.

Three infusions of saline solution were given under the skin, the first two on the nineteenth day, as above described, and the third on the twenty-second day, when the pulse was uncountable and barely perceptible after the fifth rigor. Half an ounce of brandy was added to the third infusion with benefit. Vomiting occurred after the fifth rigor, but this was the only occasion on which this symptom was at all troublesome.

On the twenty-first day the patient was put upon a water-bed, through which a continuous current of water of known temperature was maintained, so that, by lowering or raising the temperature of the water at the inlet, the bed could be cooled or its temperature raised at will. Wet-packing was now only resorted to when the temperature remained so high after a rigor as to endanger the patient's life. Until the twenty-third day, clots were passed in the motions and there was diarrhoea, but after this day the diarrhoea and haemorrhage ceased.

On the twenty-fourth day the rigors recommenced. There was a rigor at 9 a.m., and during the day the temperature gradually fell till it became $100\cdot6^{\circ}$ at 5 p.m.; the patient was conscious, but periodically lapsed into a low muttering delirium, and had hallucinations of vision. At 9 p.m. she became actively delirious, and tried to jump out of bed, continually shouting. A rigor now occurred, the temperature in one hour reaching $107\cdot8^{\circ}$. The pulse was uncountable and hardly to be felt. One hour and a half later the temperature was still 107° , and the patient was therefore put into a tepid pack, the temperature in 15 minutes falling to 105° . An ice-pack was then substituted and the temperature sank to $101\cdot2^{\circ}$ half an hour later. One-fifth of a grain of morphia was then administered, and the patient fell asleep until 5 a.m. next morning, when the temperature was still $101\cdot2^{\circ}$.

The condition of the abdomen all this time remained about the same; it was a little distended: neither liver nor spleen could be felt, and there was no free fluid in it. The tongue was dry, and there was a troublesome cough, but no signs could be found in the chest with the exception of a few rhonchi. The bowels had become constipated after the diarrhoea ceased

on the twenty-third day, and enemata were resorted to. At first motions were occasionally passed without the necessity for an enema, but as the disease progressed, the constipation increased, and was troublesome during convalescence.

Mucus was present in the stools at the end of the disease, and during the first week of convalescence. The heart never showed any signs of dilatation, and between the rigors the pulse was generally of a fair size and tension, and the rate varied in proportion to the elevation of temperature, on several occasions being from 106 to 108 only. The right leg was slightly œdematosus about the shin on the twentieth day, and at this time the left could hardly be recognised as being swollen at all. The low muttering delirium with picking at the bed-clothes, and the active outbursts during the rigors, were not noticeable after the twenty-sixth day.

The blood-examination on the twenty-sixth day was as follows :—

Typhoid serum-reaction - - - - -	1 in 100 positive.
Bacillus coli serum-reaction - - - - -	Negative.
Red cells - - - - -	3,620,000 per ccm.
Hæmoglobin - - - - -	60 per cent.
Colour-index - - - - -	0·75.
White cells - - - - -	8,100 per ccm.
Lymphocytes - - - - -	21·1 per cent.
Large lymphocytes - - - - -	4·6 "
Large mononuclear and transitional cells - - - - -	5·8 "
Neutrophils - - - - -	67·3 "
Oxyphils - - - - -	1·2 "

No parasites of any description seen.

The patient continued in this condition with almost daily rigors until the thirty-fifth day, when the highest recorded temperature was 99·6°. After this period the temperature pursued a very irregular course, finally falling to normal on the sixty-first day, and during this time only two rigors occurred. On the sixty-first day, however, the temperature rose again, and on the sixty-second day it reached 104·8°. On the sixty-third day the last rigor occurred, the temperature reaching 104·8°. The normal point was again reached on the

sixty-seventh day, when convalescence commenced. Convalescence was interrupted from the seventy-eighth to the eighty-seventh days inclusive by elevations of temperature of over 99° , none of which however reached 100° . After this time convalescence was uninterrupted, and the patient left the hospital cured on the one hundred and fifteenth day of the disease.

From the thirty-third to the forty-third days inclusive quinine sulphate was given in doses of five grains every four hours during the afternoon and evening. The temperature-curve certainly altered about this time, the rigors diminishing, as can be seen in the accompanying chart; but as no permanent effect was noticeable, and as vomiting was on several occasions set up, the drug was not persisted in. Throughout the illness very little alcohol was used, the chief cardiac stimulant on which reliance was placed being strychnine, given by hypodermic injection. The strychnine was occasionally omitted for a time, and small doses of belladonna substituted, when muscular twitchings occurred.

ANALYSIS OF RIGORS.

Onset.—In all cases the onset was sudden, and not preceded by any premonitory symptoms. The first symptoms were a subjective feeling of cold and an attack of shivering.

Sweating with the fall of temperature was not a very evident symptom, but occasionally it was more or less profuse, the 16th and 17th rigors being notable instances.

Number.—On twenty-one occasions well-marked rigors occurred, but there were several rises of temperature which occurred without shivering during the rigor-period of the disease; for instance, on the twentieth day, the first elevation to 107° only was accompanied by shivering (the second elevation to 107° is not shown on the accompanying chart), and a rise to $105^{\circ}8^{\circ}$ after the third rigor occurred without shivering.

Later on in the disease, these exacerbations of fever without shivering outnumbered the rigors. The difference is really only one of degree, the shivering depending upon the suddenness with which the temperature rises. If it rises more slowly, no rigor occurs, although the temperature may reach a considerable height; whereas there are examples of rigors occurring with a

relatively slight elevation of temperature, but on these occasions the temperature shot up suddenly, for instance in the case of the eighth, tenth, twelfth, and nineteenth rigors.

Height of Temperature.—The highest recorded temperature was 107·8° (seventh rigor on twenty-fourth day). The temperature reached 107° or above this on three other occasions ; it was above 106° on five occasions ; above 105° on seven ; 104° or above on two ; and 103° or above on three occasions.

Duration of Rigor.—The shivering lasted from fifteen minutes to half-an-hour, and on two occasions it continued for an hour. The fall of temperature lasted from half-an-hour to three hours, being usually over one hour.

Severity.—The earlier rigors were much more severe than the later ones, and accordingly produced more general disturbance, and especially affected the heart's action. In some of the earlier rigors the effect upon the pulse was profound ; on several occasions the pulse-rate went up to 160, being once or twice uncountable, and it also became exceedingly weak and irregular. On two or three occasions the patient almost died.

Time of Occurrence.—On referring to the chart a noticeable point which attracts the attention is the occurrence of the rigors in groups. Thus, after the first five rigors, the temperature fell below normal, whilst the patient was collapsed, and for two days, during which the temperature recovered itself, no rigor occurred. Following this period was a second group, consisting of four rigors, succeeded by a day free from rigors. A third group of eight rigors followed, and finally two isolated rigors, separated from each other and from the third group by intervals of one day free from rigors. I take it that at this period (thirty-eighth day of disease) the primary attack was becoming completed, when an intercurrent relapse occurred in which the two final rigors appeared. If this reading of the chart is correct, it follows that the first nineteen rigors occurred during the later part of the fastigium and during the defervescence of the primary attack, and that the twentieth rigor occurred as the temperature was rising in the first week of the relapse, and the twenty-first rigor during the defervescence of the relapse.

With regard to the time of day at which the rigors occurred, it may be shortly stated that practically an almost

equal number took place in the morning and in the evening, and that hardly any particular hour was free.

Associated Conditions.—The rigors started on the sixth day of the diarrhoea, and haemorrhage accompanied the first one. On very many occasions the exciting cause of a rigor appeared to be an attack of diarrhoea, the patient feeling a desire to go to stool, which was often passed in the bed before attention could be given by the nurses, a rigor occurring during the passage ; or the motion was passed unconsciously and attention only directed to it by the occurrence of a rigor. The rigors still persisted, however, after the diarrhoea had stopped. It is true that there was slight swelling of the legs, but this was so feebly marked that in the absence of pain or other symptom of thrombosis it could not be taken as evidence that the cause of the rigors was to be sought in thrombosis of the femoral vein. The slight oedema of the shins was most probably of toxic and hydramic origin.

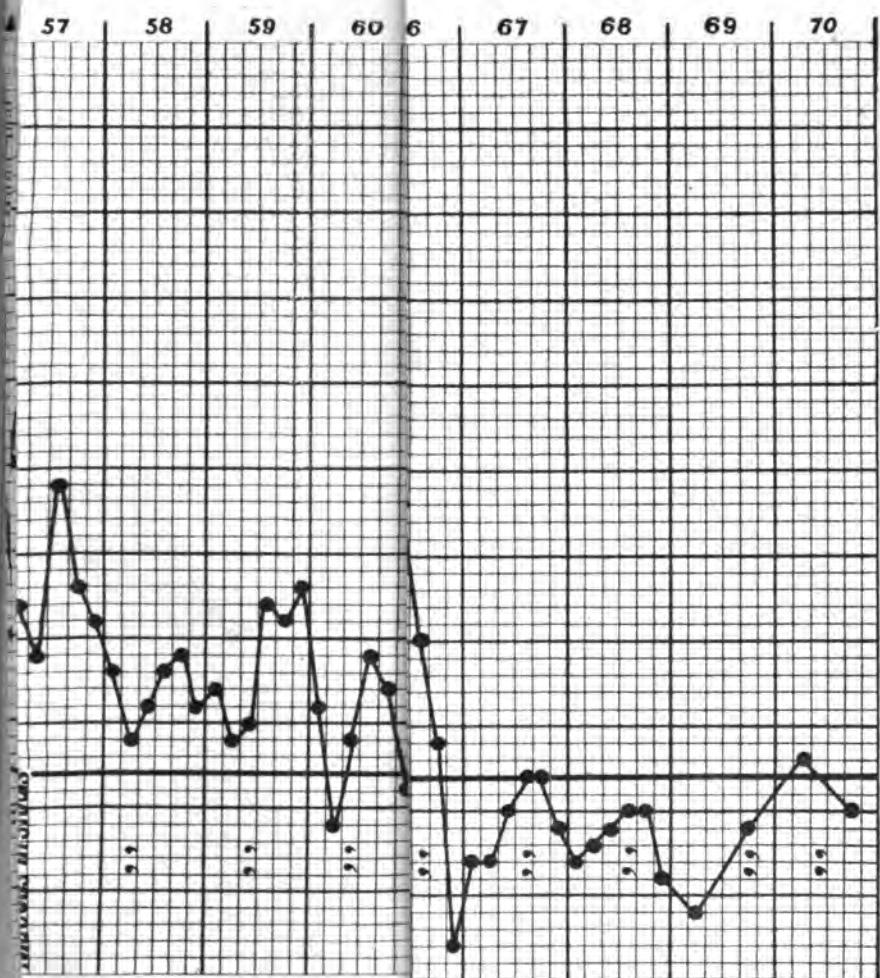
Delirium occurred both during and in the intervals of the rigors ; in the former case it was of the active type, the patient shouting and trying to get out of bed ; in the latter case it was of the low muttering type, with picking at the bedclothes.

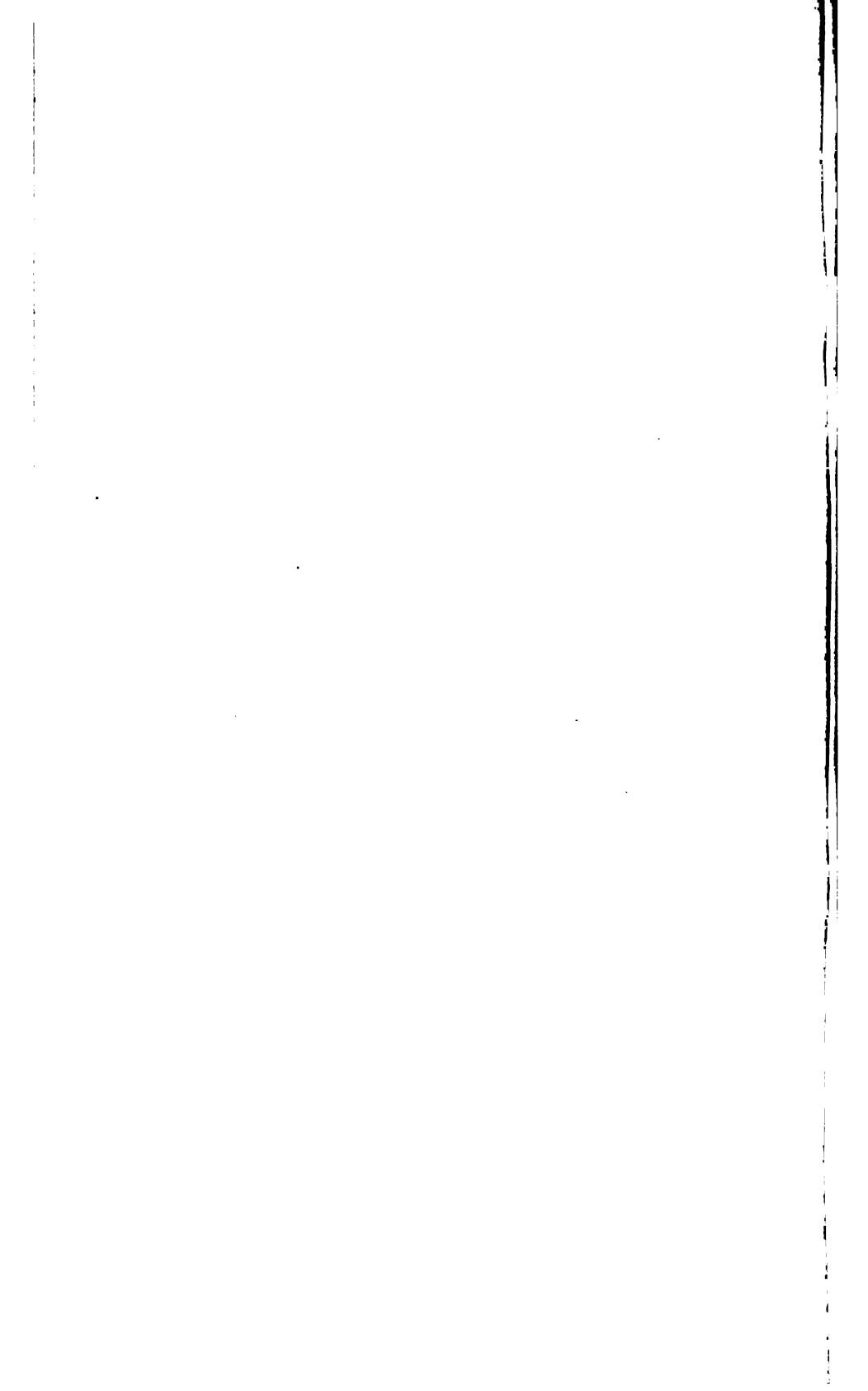
Although repeatedly sought for, no complication of any description could be found as a cause for the rigors, and the blood-examination for malarial parasites was negative.

On turning to the literature on the subject, a large number of cases similar in description to the above, though hardly so severe, are found ; and many different causes have been ascribed to them by the various writers.

Abercrombie,¹ in speaking of some affections of the nervous system in enteric fever, quotes a case in which there were eight rigors ; the first took place on the second day of the onset of a first relapse, and the second, third, fourth, and fifth during the second relapse, which was complicated by thrombosis of both femoral veins. He considers that the sixth rigor was due to intestinal irritation, and the seventh and eighth to mental worry.

He lays stress upon the opinion that these rigors may be due to constipation or simple intestinal irritation, in which case he says they occur late in the disease ; the earlier in the course





of the disease they occur, the more likely is it that they are due to peritonitis or perforation. He says that the temperature may reach 106° , and subside rapidly after an enema. The case in point recovered.

Bouveret² describes four cases, in all of which the rigors occurred late in the disease during defervescence. No local cause could be found in any of them, and the general condition of the patients was satisfactory. There were no prodromata, the first symptom being shivering, which lasted from one to one and a half hours, the temperature varying from 103.4° to 107° . A hot stage succeeded this, which lasted eight to twelve hours; and a sweating stage followed. The similarity to malaria was, therefore, very great; but he did not consider them as due to a concomitant malarial infection, because there was no regular periodicity, quinine produced no effect, there was no malaria in the country, and the cases occurred during the winter. He says that even after a violent rigor the general condition of the patients was often very good, and that they are not really dangerous, convalescence not being sensibly retarded.

In explanation he says that very generally a violent rigor indicates that a toxic or pyrogenetic substance has abruptly entered the circulation, and that this substance is not a secondary infection, but proceeds from the infection itself. He says that in his cases defervescence was interrupted by a large dose of toxine being thrown into the blood, and that the reestablishment of local circulations in lesions of the intestine, spleen and mesenteric glands might contribute to this result. He also states that another factor is the great impressionability of the thermogenetic centres on the decline of a long fever, and that the temperature is so very unstable in the convalescence of typhoid fever that even emotion can raise it.

Bryant,³ in a paper on Hyperpyrexia in typhoid fever, describes six cases, in one of which rigors occurred. He suggests as possible causes of the hyperpyrexia either septic absorption from the ulcers, or the typhoid bacillus or its products circulating in the blood and affecting the thermal centres in the brain.

Church⁴ records the case of a girl, twelve years of age, in which there were twenty-two rigors in a primary attack, the first occurring on the sixth day of the disease; twenty-five in

the first relapse, the onset of which was announced by a rigor, and six in the second relapse, making a total of fifty-three rigors. The patient made a good recovery. In explanation he suggests that the rigors took the place of delirium, which was absent during the whole illness, owing to an idiosyncrasy in the girl's nervous system, in the same way as a convulsive attack may take the place of a rigor.

Frenkel⁵ describes a case of moderate severity, in which a relapse occurred on the twenty-seventh day of the disease, which ended in recovery. A series of rigors began on the fifteenth day of the relapse. The liver was slightly enlarged, and tender to percussion.

He offers three hypotheses :—

(1) Thrombosis of branches of mesenteric veins which has been found *post mortem* in some cases.

(2) Small abscesses in the liver, of which nineteen cases have been reported and verified *post mortem*; these have followed ulceration of the bile-ducts, suppurative pylephlebitis, or pyæmia.

(3) Malaria as a complication of typhoid, as the patient came from Italy. The blood could not be examined, and therefore the evidence was not conclusive.

Gee,⁶ in speaking of quotidian remissions of the fever in typhoid, mentions the case of a young woman in the last week of the disease who had a severe rigor. He explains its occurrence as being due to a rapid rise of temperature after a complete morning remission.

Herringham⁷ records a series of cases in which rigors occurred, and as possible exciting causes mentions undressing or slight washing, the use of phenacetin or sponging, or some abdominal stimulus such as abdominal pain, the use of an enema, or the passage of a motion. He says that they are commoner during lysis, when the oscillations in the temperature-curve become greater. These oscillations are liable to be irregular, as a result of some irregular action of the thermal centres in the brain, before the latter recover their former state after cessation of the morbid stimulus. A very slight cause is sufficient to upset the unstable thermotaxis of typhoid patients. He also mentions as a possible cause thrombosis of small internal veins.

Osler⁸ describes chills in typhoid fever apart from complications—

1. At the onset of the disease.
2. At the onset of a relapse.
3. As a result of treatment by antipyretics or external applications, which he says is the commonest cause ; and that the chills cease after the treatment is stopped.
4. During convalescence in severe and protracted cases, which may be due to septic absorption.

Poole⁹ quotes five cases, and suggests as causes mental shock, constipation, and possible antipyretics.

Wunderlich¹⁰ mentions rigors in connection with complications, and also says that "occasionally rigors may occur off and on as a kind of prologue to the proper course of the disease."

The case described in this paper appears to me to afford considerable support to the supposition that some irritation of the intestinal mucous membrane is, in a large number of these cases, responsible for acting as an exciting cause for the rigors. There is no doubt that rigors may be excited reflexly by peripheral irritation. The sudden exposure of the skin to cold or the passage of urine often causes a transient shiver. The passage of a catheter or the irritation of a urinary or biliary calculus may cause rigors, and the rigor may occur before the catheter is withdrawn, thus negativing the view that all these rigors are the result of septic absorption. In Allbutt's *System of Medicine* Hale White¹¹ quotes a case of Dr. Goodhart's ; the patient suffered from membranous colitis, and complained of feeling cold, and sometimes had a rigor when the bowels were relieved. The early rigors in the case under discussion which were associated with diarrhoea are in my opinion exactly parallel with those occurring in Dr. Goodhart's case. Later on in the disease the constipation and treatment by enemata may have likewise been responsible as exciting causes. It might be argued that the shivering caused the evacuation of a liquid motion ; but, as against this, it may be stated that the patient felt, and frequently stated, that she was going to have the stool during which a rigor occurred.

Many other apparently insignificant conditions, as especially mentioned by Herringham, may in other cases act as exciting

causes for a reflex rigor. Rigors as a result of treatment probably come under the same category.

The other group of cases in which the cause has been attributed to thrombosis of mesenteric veins, small abscesses of liver or kidneys, malaria or septic absorption, are in reality secondary, in that the rigors are due to a complication. Rigors at the onset of the disease or of a relapse simulate a condition of affairs which occurs in many acute specific diseases. Individual predisposition probably plays an important part in many of these cases, as it is a well-known fact that the temperature will rise to a high level as the result of a trivial affection in some people, whereas in others the same affection would be attended with a comparatively slight alteration in the temperature, and it appears that this susceptibility to alterations in the temperature, or unstable thermotaxis, may to a large extent run in certain families. No history pointing to a susceptibility of this kind could, however, be elicited in the present case.

The sponging and cool water-bed may undoubtedly have contributed somewhat in the production of the rigors, but it is a fact that the patient would on one occasion assuredly have died had she not been treated by hydrotherapy. The vaginal discharge could not possibly have been a cause, and it has already been pointed out that the patient probably never had femoral thrombosis. Phenacetin was only given on one occasion, fourteen days before the first rigor, and therefore could not have been responsible.

Another point confirmed and well brought out by this case relates to prognosis. All the above observers insist that these rigors do not materially affect the prognosis ; and although this is not absolutely true in the present instance, on account of the profound effect produced upon the patient by them, yet it may be stated that with careful treatment the vast majority of such patients ought to recover, the present case being a living example of this statement.

Enough has already been said about treatment in describing the case, and since the rigors cannot be well avoided, they must be treated on general principles, bearing in mind the fact that they are not of such serious import as their appearance might lead one to think.

REFERENCES.

- ¹ Abercrombie: "On some Affections of the Nervous System met with in association with an attack of Enteric Fever," *Med. Chir. Trans.*, Vol. LXXX., p. 162.
- ² Bouveret: "Sur les grands accès fébriles de la défervescence de la Fièvre Typhoïde," *Lyon Médical*, 1892, Tome LXX., pp. 177 and 211.
- ³ Bryant: "One Hundred Cases of Hyperpyrexia," *Guy's Hospital Reports*, 1893, Vol. L., p. 385.
- ⁴ Church: "A case of Typhoid Fever with relapses, unusually high temperatures, and frequent rigors," *St. Bartholomew's Hospital Reports*, 1896, Vol. XXXII., p. 14.
- ⁵ Frenkel: "Sur les grands accès fébriles de la défervescence de la Fièvre Typhoïde," *Lyon Médical*, 1892, Tome LXX., p. 251.
- ⁶ Gee: "Remarks upon Typhoid Fever," *St. Bartholomew's Reports*, 1874, Vol. X., p. 11.
- ⁷ Herringham: "On the Occurrence of Rigor and Collapse in Typhoid Fever," *St. Bartholomew's Reports*, 1896, Vol. XXXII., p. 107.
- ⁸ Oaler: "Chills in Typhoid Fever," *Johns Hopkins Hospital Reports*, 1895, Vol. V., p. 445.
- ⁹ Poole: "An account of some cases occurring in the Maidstone Typhoid Fever Epidemic," *Guy's Hospital Reports*, 1896, Vol. LIII., p. 127.
- ¹⁰ Wunderlich: *Medical Thermometry*, 1875 (New Sydenham Society).
- ¹¹ Hale White on "Diseases of the Colon," *Allbutt's System of Medicine*, Vol. III., p. 945.

Reference may also be made to :—

Box: "Special Analysis of Enteric Fever Cases," *St. Thomas's Hospital Reports*, 1895, Vol. XXIV., p. 248.

Thompson Gilman: "Notes on the observations of Malarial Organisms in connection with Enteric Fever," *Trans. of the Association of American Physicians*, 1894, Vol. IX., p. 110.



equal number took place in the morning and in the evening, and that hardly any particular hour was free.

Associated Conditions.—The rigors started on the sixth day of the diarrhoea, and haemorrhage accompanied the first one. On very many occasions the exciting cause of a rigor appeared to be an attack of diarrhoea, the patient feeling a desire to go to stool, which was often passed in the bed before attention could be given by the nurses, a rigor occurring during the passage ; or the motion was passed unconsciously and attention only directed to it by the occurrence of a rigor. The rigors still persisted, however, after the diarrhoea had stopped. It is true that there was slight swelling of the legs, but this was so feebly marked that in the absence of pain or other symptom of thrombosis it could not be taken as evidence that the cause of the rigors was to be sought in thrombosis of the femoral vein. The slight oedema of the shins was most probably of toxic and hydramic origin.

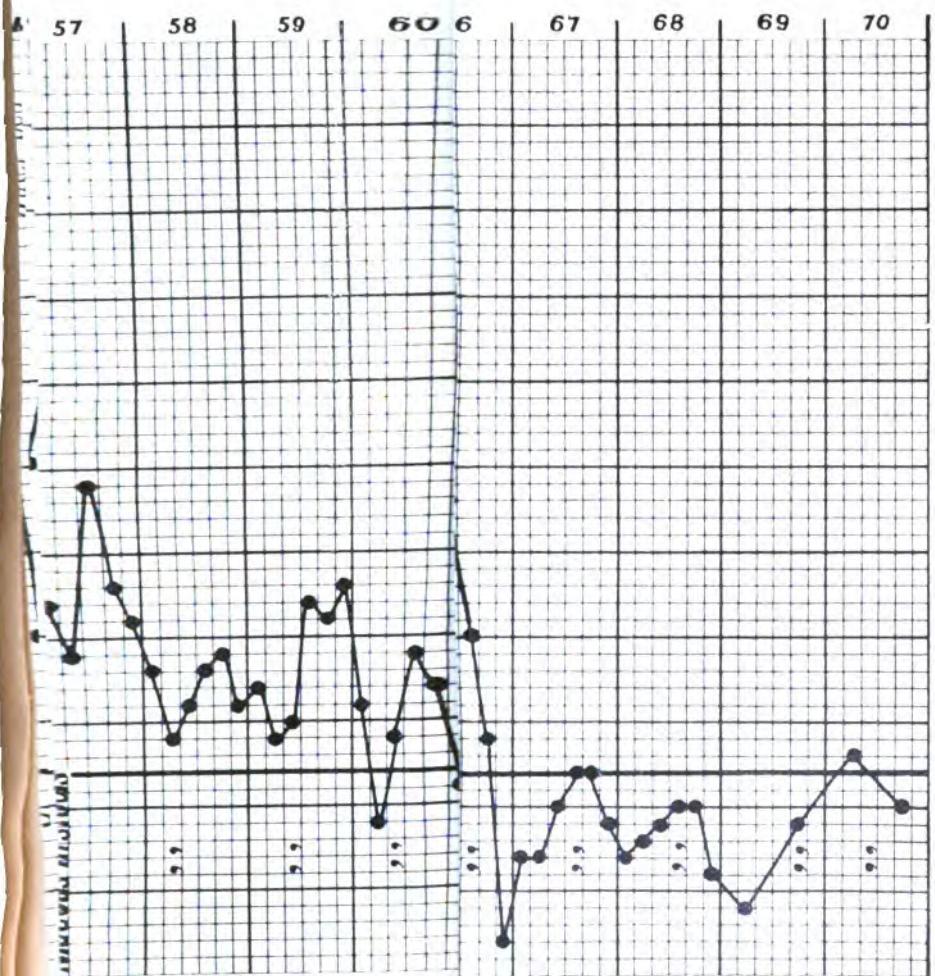
Delirium occurred both during and in the intervals of the rigors ; in the former case it was of the active type, the patient shouting and trying to get out of bed ; in the latter case it was of the low muttering type, with picking at the bedclothes.

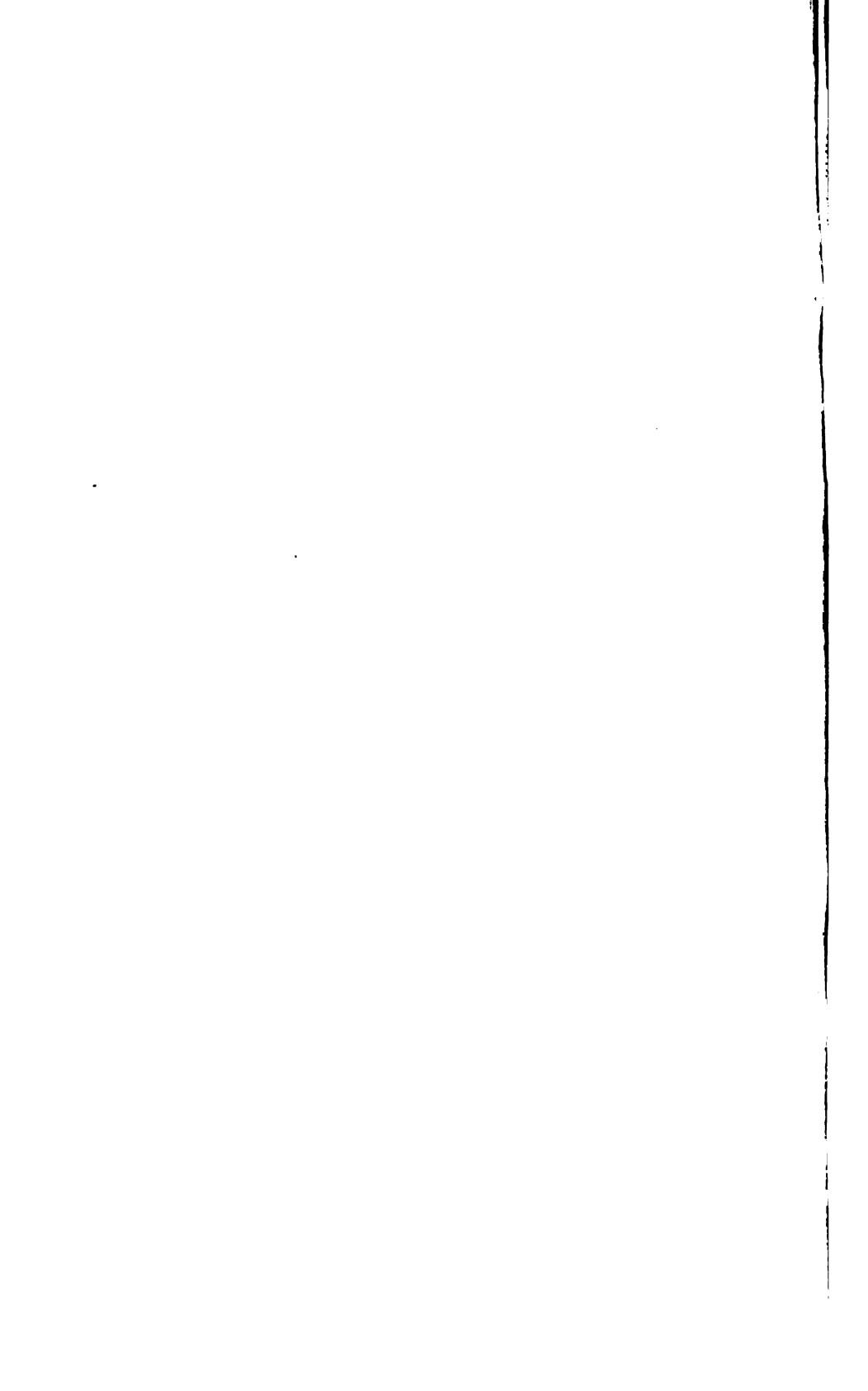
Although repeatedly sought for, no complication of any description could be found as a cause for the rigors, and the blood-examination for malarial parasites was negative.

On turning to the literature on the subject, a large number of cases similar in description to the above, though hardly so severe, are found ; and many different causes have been ascribed to them by the various writers.

Abercrombie,¹ in speaking of some affections of the nervous system in enteric fever, quotes a case in which there were eight rigors ; the first took place on the second day of the onset of a first relapse, and the second, third, fourth, and fifth during the second relapse, which was complicated by thrombosis of both femoral veins. He considers that the sixth rigor was due to intestinal irritation, and the seventh and eighth to mental worry.

He lays stress upon the opinion that these rigors may be due to constipation or simple intestinal irritation, in which case he says they occur late in the disease ; the earlier in the course





of the disease they occur, the more likely is it that they are due to peritonitis or perforation. He says that the temperature may reach 106° , and subside rapidly after an enema. The case in point recovered.

Bouveret² describes four cases, in all of which the rigors occurred late in the disease during defervescence. No local cause could be found in any of them, and the general condition of the patients was satisfactory. There were no prodromata, the first symptom being shivering, which lasted from one to one and a half hours, the temperature varying from 103.4° to 107° . A hot stage succeeded this, which lasted eight to twelve hours; and a sweating stage followed. The similarity to malaria was, therefore, very great; but he did not consider them as due to a concomitant malarial infection, because there was no regular periodicity, quinine produced no effect, there was no malaria in the country, and the cases occurred during the winter. He says that even after a violent rigor the general condition of the patients was often very good, and that they are not really dangerous, convalescence not being sensibly retarded.

In explanation he says that very generally a violent rigor indicates that a toxic or pyrogenetic substance has abruptly entered the circulation, and that this substance is not a secondary infection, but proceeds from the infection itself. He says that in his cases defervescence was interrupted by a large dose of toxine being thrown into the blood, and that the reestablishment of local circulations in lesions of the intestine, spleen and mesenteric glands might contribute to this result. He also states that another factor is the great impressionability of the thermogenetic centres on the decline of a long fever, and that the temperature is so very unstable in the convalescence of typhoid fever that even emotion can raise it.

Bryant,³ in a paper on Hyperpyrexia in typhoid fever, describes six cases, in one of which rigors occurred. He suggests as possible causes of the hyperpyrexia either septic absorption from the ulcers, or the typhoid bacillus or its products circulating in the blood and affecting the thermal centres in the brain.

Church⁴ records the case of a girl, twelve years of age, in which there were twenty-two rigors in a primary attack, the first occurring on the sixth day of the disease; twenty-five in

a similar manner, a bacteriotropic substance obtained by the inoculation of a particular microorganism is operative only upon the particular species of microorganism in question. A tubercle-vaccine, for instance, is responded to, so far as it is known, by an elaboration of only tuberculo-tropic elements ; a typhoid vaccine only by elaboration of typhotropic elements ; a staphylococcal vaccine only by elaboration of staphylococcal elements.

**CHARACTER OF THE ANTITROPIC ELEMENTS OBTAINED IN
THE CASE WHERE THE VACCINE INOCULATED CONTAINS
IN ADDITION TO SUBSTANCES HELD IN SOLUTION ALSO
FORMED ELEMENTS.**

In the case where an animal is to be inoculated with the blood of another animal, we are dealing with a vaccine such as is here contemplated. We are in such a case inoculating red and white blood-corpuscles suspended in a plasma or serum which contains a variety of different albuminous substances. In a case where a bacterial culture is inoculated, we are similarly dealing with formed elements suspended in a solution which may contain a variety of other bacterial products. It will be instructive to consider what will happen in these cases. When we inoculate blood, we obtain as our harvest a complicated mixture of haemotropic elements, in particular erythrocytotropic elements, leucocytotropic elements, and elements which we may group together as serotropic elements. The first two of these disorganise, respectively, the red or the white corpuscles, the last-mentioned (or some of them) produce a precipitation in the serum. Something exactly similar occurs where an ordinary bacterial culture is inoculated. We obtain here in response to the inoculation of the bacteria, a development of bacteriotropic elements. These may, as we have seen, agglutinate, kill, dissolve, and otherwise disorganise the bacteria. Further, in a case where the liquid medium in which the bacteria are suspended contains certain specific varieties of toxines, we may obtain, as in the case where diphtheria-toxine or tetanus-toxine is inoculated, toxitropic elements in the form of antitoxines which combine with and neutralise the poisonous properties of the toxines.

Inasmuch as, in the case of preventive inoculation against typhoid, we are concerned, in particular to achieve the

destruction of such typhoid bacilli as may effect an entrance, we shall do well here to consider certain questions which have relation to the disorganisation and destruction of formed elements by antitropic substances, and of bacteria by bacteriotropic elements, developed in the course of immunisation.

DISORGANISATION AND DESTRUCTION OF RED BLOOD-CORPUSCLES BY ERYTHROCYTOTROPIC SUBSTANCES AND OF BACTERIA BY BACTERIOTROPIC SUBSTANCES, AND SELECTION OF A VACCINE WHICH WILL INDUCE THE ELABORATION OF THE ANTITROPIC SUBSTANCES REQUIRED FOR THE DESTRUCTION OF THESE FORMED ELEMENTS.

It is impossible to conceive of formed elements furnishing, while they remain intact, a chemical stimulus, such as would induce an elaboration of antitropes complementary to the chemical constituents of those formed elements. The appropriate chemical stimulus will be furnished only when solution has taken place.

In point of fact it can be shown that, where foreign blood is introduced into the animal organism, the formed elements—in particular the red blood-corpuscles—are dissolved. Similarly it can be shown that, where typhoid bacilli are introduced into the blood or lymph, these also are dissolved.

The question of solution of the formed elements having in particular instances been set at rest, we are immediately confronted with the question as to whether it is indispensable for the achievement of the destructive and antitropic substances which we require, that the complex molecule which constitutes the chemical basis of the formed element should be introduced into the organism in an absolutely unaltered condition. It will be recognised that upon the answer which this question receives will depend the scientific justification for the employment as vaccines of bacterial cultures which have been chemically altered by heating, or in other ways.

It will be convenient to commence by ascertaining what modifications of the vaccine are permissible in the case of inoculation undertaken with the design of conferring upon an animal a power of haemolysing a foreign blood.

We may, as Dr. Bulloch has recently shown, substitute for the intact or dissolved red corpuscles, which furnish the

vaccine ordinarily employed, the stromata of the red corpuscles. We may go further still and may employ for our vaccine, in lieu of the fresh stromata, stromata which have been desiccated in an exsiccator.

These substitutions may, it appears, be made without any sacrifice of efficacy. In point of fact, it is not certain that the blood of an animal inoculated with a vaccine made from the desiccated stromata does not haemolyse more effectively than the blood of an animal inoculated with intact red corpuscles or with the simple watery solution.

Dr. Bulloch experimented further (*a*) with stromata which had been extracted with ether; (*b*) with the ether-extractives; and lastly (*c*) with the haemoglobin apart from the stromata. The animals subjected to these inoculations did not in any case develop any haemolytic power.

These experiments afford very interesting extension of data previously obtained in connection with bacterial vaccines.

The bactericidal, bacteriolytic and agglutinating powers which may be developed in animals by the inoculation of living typhoid cultures, and in man by the invasion of his organism by the typhoid bacillus, are obtained with equal facility by the inoculation of typhoid cultures which have been sterilised by heating.

Exactly the same thing applies in connection with the vibrio of cholera.

Mutatis mutandis, the same thing applies in case of the staphylococcus. The increased phagocytosis and very favourable clinical results which I have obtained in acne, furunculosis, and syphilis by the inoculation of heated staphylococcus-cultures are evidence that a power of destroying the staphylococcus can be developed by these means.

It is to be noted that, while it has been thus established that the power of disorganising bacteria can be quite well obtained by the inoculation of cultures which have been chemically altered by heating, it is manifest that a departure from the chemical constitution of the original culture is admissible only so far as it proves itself to be a modification which leaves unaffected that chemical element in the vaccine which evokes the elaboration of destructive antitropic substances. It is of interest in this connection to note that the German Plague Commission satisfied itself that the vaccinating power of a

plague-culture is impaired or abolished when the customary addition of antiseptics is made to the unheated culture, instead of (as is ordinarily done) to the already-heated culture.

**PHYSIOLOGY OF THE REACTION OF IMMUNISATION IN
RELATION TO THE PROPER ADJUSTMENT AND PROPER
INTERSPACING OF THE DOSES OF VACCINE.**

The success of an inoculation-process does not in any case depend only upon the selection of the appropriate vaccine, upon the aseptic preparation of the vaccine, and upon the carrying-out of the inoculation in an aseptic manner. There is required further, upon the part of the operator, a certain comprehension of the physiology of immunisation, and, in particular, an apprehension of the general features of the reaction of immunisation.

**LAW OF THE EBB AND FLOW, AND OF THE SUBSEQUENT
MAINTENANCE OF A HIGH TIDE OF IMMUNITY.**

There succeeds in every case of inoculation of a vaccine a negative phase, characterised by an impoverishment of the blood in antitropic substances. With this ebb or negative phase is associated a phase of increased susceptibility to bacterial infection, or, as the case may be, of increased sensibility to the action of the particular poison. This negative phase generally coincides with a period of greater or less constitutional distress.

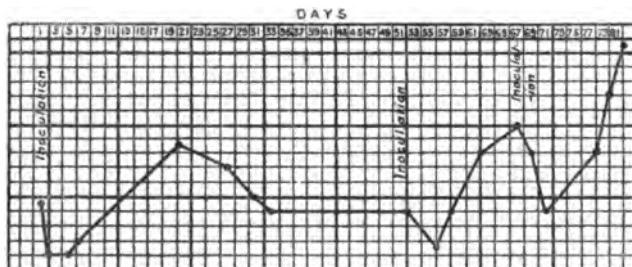
The negative phase is succeeded by a positive phase, characterised by the flooding of the circulating blood with newly-formed antitropic substances. It may be presumed that this phase is associated with a maximum resistance to a bacterial invasion and a minimum sensibility to the poisonous action of the particular vaccine.

Finally there supervenes upon the positive phase, which, like the negative phase, is essentially a transient phenomenon, a permanent, or relatively speaking permanent, high tide of diminished susceptibility. During this period the blood shows, as compared with the period antecedent to inoculation, an increased content in antitropic substance. Moreover the organism seems to possess during this period a greater power of response to a renewal of the vaccinating stimulus.

Basis of Experimental Fact upon which the Law of the Negative and Positive Phase rests.—Inasmuch as the law which has just been enunciated is a law of absolutely fundamental importance in connection with the physiology of immunisation

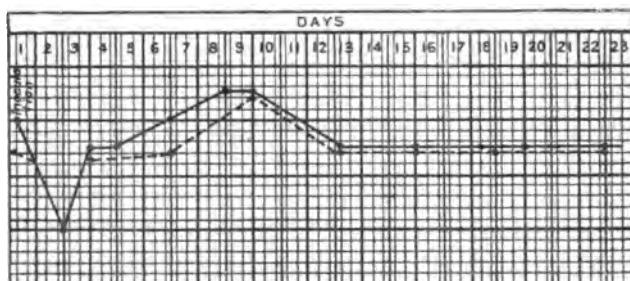
it will be well to set out clearly the basis of experimental fact upon which it rests.

The law emerges for the first time in a paper of Ehrlich and Brieger, in which there was set forth a curve of the reaction of immunisation. This curve, which is reproduced below, sets forth the variation in the amount of antitropic substances excreted in the milk from day to day during the course of immunisation. The particular experiment which furnished this tracing was an experiment in which tetanus-toxine was inoculated into a goat which had already by previous inoculations been rendered to some degree resistant to the effect of this poison.



Curve obtained by Ehrlich and Brieger, showing the content of the milk in tetanus-antitoxine from day to day during the course

The same succession of negative phase, positive phase, and higher base-line is disclosed in a curve of the reaction of immunisation, which is furnished by Salomonsen and Madsen. In this particular case the curve sets forth the variation in the amount of diphtheria-antitoxine in the blood and milk of a mare during the course of immunisation.



Curve obtained by Solomonsen and Madsen, showing the content of the milk and blood in diphtherial antitoxine from day to day during the course of immunisation.

As yet the law had disclosed itself only as the law which governed the output of antitoxine from the antitoxine-forming centres.

I may perhaps claim to have been the first to bring out by my measurements of the bactericidal power of the blood after typhoid inoculations, and of the phagocytic power of the blood after staphylococcus-inoculations, the fact that the law of the negative and positive phase governs the production of bacteriotoxic substances just in the same way as it governs the production of antitoxines (toxitropic substances).

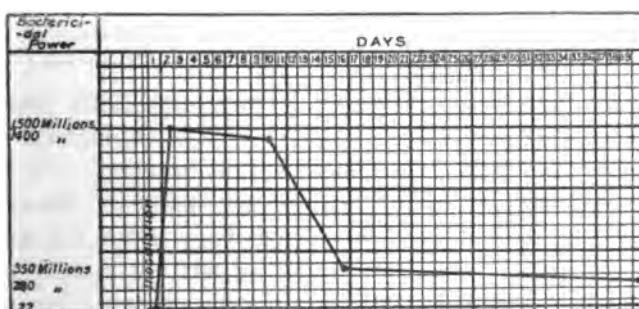
Jorgensen and Madsen adduced proof that the law of the negative phase applied also to the formation of the agglutinins of typhoid and cholera.

It was further shown by Morgenroth in connection with the development of galactotropic substances in the organism, and by Bulloch, whose work was supplemented afterwards by the researches of Sachs, that the production of galactotropic and haemotropic substances follows precisely similar lines.

Thus by a series of successive extensions the law of the positive and negative phase has revealed itself to be the law which governs the production of antitropic substances generally. It is, in other words, the general law of immunisation.

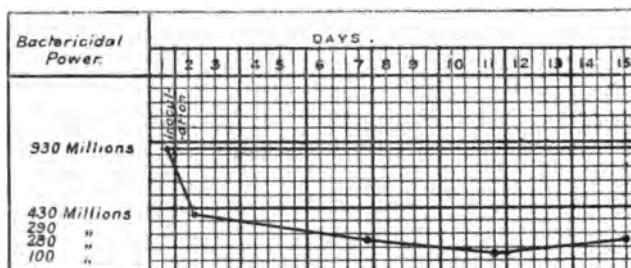
DEPENDENCE OF THE NEGATIVE PHASE UPON THE DOSE OF THE VACCINE.

The intensity of the negative variation and the duration of this phase of diminished antitropic substances in the blood is, as I have been able to show in connection with the typhoid



Elision of the negative phase. Curve obtained by the author, showing the content of the blood in bactericidal substances, in the case of a patient inoculated with a small dose of antityphoid vaccine.

and staphylococcic inoculations, directly dependent upon the dose of vaccine administered. I have shown in a case of typhoid inoculation that where very small doses are administered—that is to say, doses insufficient to set up appreciable constitutional disturbance—the positive phase is already fully developed within twenty-four hours after the inoculation. A



Development of a prolonged negative phase. Curve obtained by author, showing content of the blood in bactericidal substances in the case of a patient inoculated with a large dose of anti-typhoid vaccine.

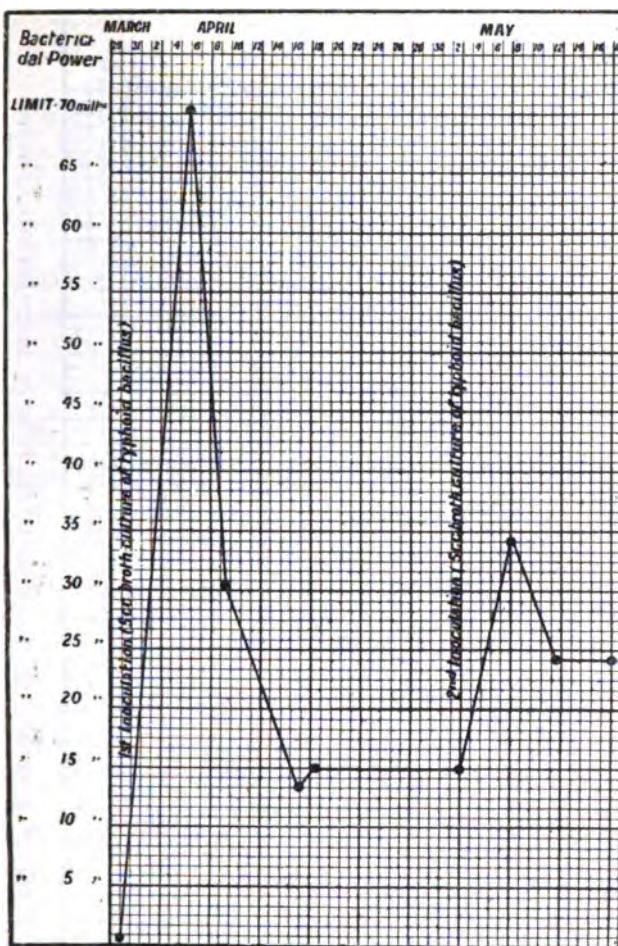
very fugitive negative phase has, it may be noted, quite recently come under the observation of Sachs in connection with the immunisation of animals against foreign blood. The curves which appear above illustrate respectively the elision of the negative phase and the prolongation of that phase. The differences here in question were dependent on the employment in the one case of a small, in the other of a large dose of vaccine.

CUMULATIVE EFFECTS OF TWO OR MORE INOCULATIONS.

Of great practical importance in connection with resort to repeated inoculation is a knowledge of the cumulative effect produced of two or more successful inoculations.

Cumulation may take place in two opposite directions. When in the case of two successive inoculations the second falls upon the positive phase of the former inoculation, or, as the case may be, on any period when the blood contains an increased quantity of antitropic substances, there is developed a cumulative high tide of immunity.

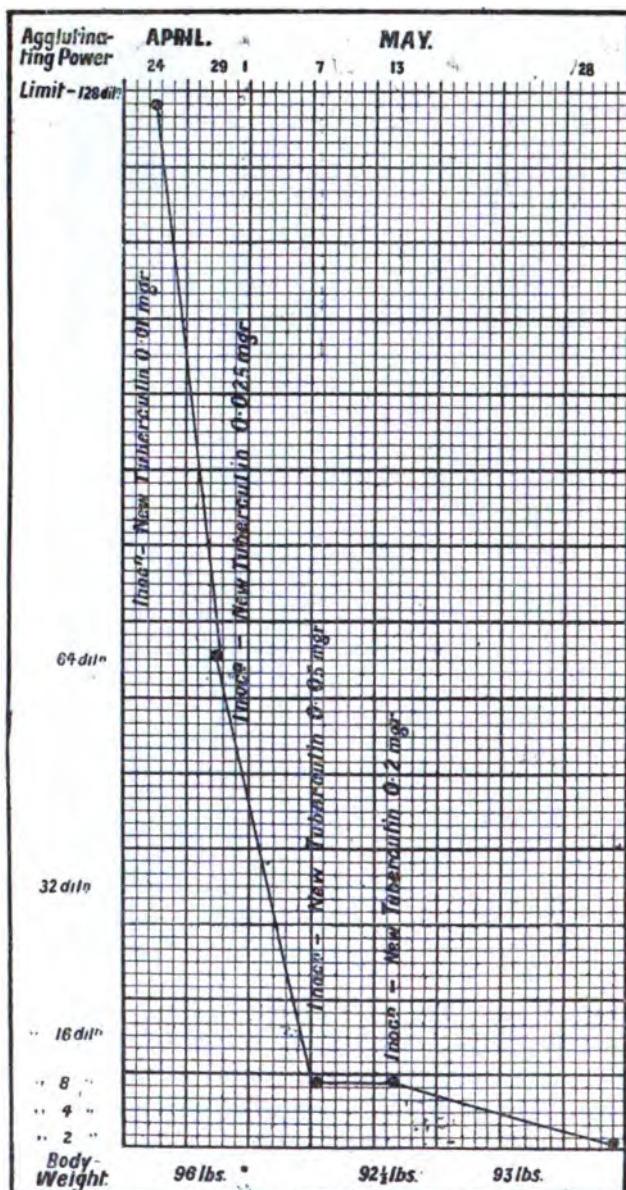
When, on the contrary, the second inoculation falls on the negative phase of the first, the cumulation takes place in the



Cumulative effects of two inoculations properly interspaced. Curve obtained by the Author and Capt. W. Glen Liston, setting forth the content of the blood in bactericidal substances in the case of a rabbit inoculated with anti-typhoid vaccine.

direction of the negative phase. There is developed then a condition of cumulative susceptibility.

In Part II. of the paper I propose to consider the application of the above principles to preventive inoculation against typhoid fever. I shall also have occasion to pass in review the statistical results which have been obtained by such



Cumulative effects of a series of inoculations improperly interspaced. Curve obtained by the Author, setting forth the content of the blood in agglutinating substances in the case of a patient treated with tubercular vaccine (Koch's new tuberculin).

inoculation in the army, and on the other hand the action which has been taken on this matter by the newly-constituted Medical Advisory Board.

THE TREATMENT OF ENTERIC FEVER.

BY SIR JOHN W. MOORE, M.D., D.P.H., B.A. (UNIV. DUBL.), F.R.C.P.I.,

Physician to the Meath Hospital and County Dublin Infirmary.

“*Sed quod præ cæteris animadverto, in nullo morborum genere, tantù opus est patientiæ, expectatione, cunctationeque, ad bene et feliciter medendum, tanquam ad bene curandum febres mesentericas.*” So wrote the Italian physician, Georgio Baglivi,¹ towards the close of the seventeenth century. His words are true for all time, and apply with special force to typhoid or enteric fever, for there is no other disease which so taxes to the uttermost the resources of the physician. Of every “turn” in enteric fever, of every day or hour which marks its course, it may truly be said : “*Latet anguis in herba.*” The attitude of the physician must day by day be one of “armed expectancy”—to borrow an expressive phrase given by Dujardin-Beaumetz in 1889 to that form of symptomatic treatment which has also been called “the medication of indications.”

In this paper, I propose to touch briefly on only a few points which have made a fixed impression upon my mind as a result of an experience extending over many years.

I.—THE SANITARY HOUSING OF THE PATIENT.

Enteric fever should never be treated in a house with defective, leaking drains, or in which the water-supply is open to the suspicion of being the source of the original poisoning. No other specific fever, perhaps, requires such close attention to the sanitary surroundings of the patient smitten with the disease. Nothing is more striking than the marvellous improvement which often follows an enteric-fever patient's removal from the tainted atmosphere of a sewage-reeking dwelling to the airy, well-warmed, wholesome ward of a hospital. In the insanitary home, the patient lies day after day inhaling or swallowing repeated doses of the fever-poison.

¹ Read before the Section of Medicine in the Royal Academy of Medicine in Ireland, on Friday, November 20, 1903.

² *Opera Omnia.* Rome, 1696. Ed. Sext. Lugduni, 1704, page 54.

But, what is still more important, his vital powers are impaired by breathing stale and septic air, and so he goes under in the battle.

On September 30, 1903, I was called to see C. M., a fine tall young man, aged 27, who was lying ill in an old badly-drained house in Aungier Street, Dublin. He was on the 9th day of a well-marked attack of enteric fever. The axillary temperature was $103\cdot2^{\circ}$ F. There was considerable enlargement of the spleen, and a very few rose-spots were found on the chest and abdomen. He was removed on the next day (October) to the Epidemic Wing of the Meath Hospital. On admission he looked heavy and profoundly ill. The pulse-rate was only 92, but the respirations were 26, without any pulmonary trouble to account for the rapid breathing. The temperature was already falling, and continued to do so for 8 days, when, on the 18th day of the attack, it became subnormal in the evening as well as in the morning. On October 16th (the 25th day) the Widal test gave a decided and positive reaction in a dilution of 1 in 40. C. M. continued to progress most favourably and was apparently convalescent when, on Saturday, October 24th, he had a "chill" followed by headache, the axillary temperature rising to 100° in the evening. Next day a maximum of 102° was reached, and on Monday, October 26th, the average temperature was 102° , the range being only from $101\cdot6^{\circ}$ in the morning to $102\cdot4^{\circ}$ in the evening. A very few fresh rose-spots made their appearance on Wednesday, October 28th, when also the spleen was found to be enlarged. In a word, a true relapse had set in. It ran an even and uncomplicated course of 19 days, the temperature-chart presenting marked morning remissions and evening exacerbations, and in general a typical example of defervescence by lysis.

One could not help attributing the rapid improvement in this man's state to his timely removal from an unhealthy dwelling-house to a clean and well-ventilated ward in the hospital. For the relapse it is difficult to account, since the circumstances remained unchanged. The absence of abdominal symptoms would suggest that the case was possibly one of "spleno-typoid," a form of the disease in which, perhaps, secondary infection may be caused by the discharge into the

circulation of tainted blood hitherto stored up in the engorged spleen.

II.—THE RELATION OF DIARRHŒA TO EARLY PURGATION.

Diarrhoea is too often accepted without question as one of the most constant symptoms of enteric fever. According to Murchison, diarrhoea was present in 93 out of 100 cases observed by him. There can be no doubt that the severity and danger of this form of fever are closely related to the intensity of the diarrhoea, understanding by the term not only frequent, but also copious, evacuations. On the other hand, the bowels are often even obstinately constipated, and sometimes this is by no means a favourable indication. A tendency to constipation has of late years been observed in a majority of the enteric-fever patients treated in the epidemic wing of the Meath Hospital, and the treatment of this condition often taxes the physician's ingenuity to the uttermost. To this subject I will afterwards refer in more detail.

But what I want to emphasise just now is the fact that in many instances troublesome diarrhoea is started by routine and unreflecting purgation at the beginning of the fever. For this bad practice the patient is frequently, the physician is occasionally, to blame. The onset of enteric fever is often mistaken for a mere "bilious attack." An aperient pill is taken, followed by a brisk saline cathartic. The bowels act freely, and continue to do so day after day. When a physician is called in to attend a "bilious attack," in a previously healthy individual, he should not lose sight of the possibility of enteric fever. Careful observations on the temperature, particularly in the afternoon or evening, will aid in the diagnosis. It is of course desirable that the intestinal tract should be swept and cleansed at the outset of enteric fever, but the process must be carried out with extreme caution, and all strong purgation should be "shunned like the plague"—to borrow Georgio Baglivi's expressive phrase.

III.—ANTIPYRESIS GENERALLY UNCALLED FOR.

Any physician who has had extensive experience of enteric fever must agree with Professor Arnaldo Cantani,¹ of Naples,

¹ "Ueber Antipyrese." *Transactions of the Tenth International Medical Congress* Berlin, 1890, Vol. I., page 152.

in looking upon fever or "pyrexia" in the light of a general or essential, and—within definite limits—a beneficial reaction of the organism to changes in metabolism and in the blood, due to the causative agent of the disease. This reaction is necessary to bring about cure, and pyrexia may be useful towards this end, so long as tissue-consumption does not rise to exhaustion, and the heart-muscle or the nervous system does not suffer from hyperpyrexia. Viewing the fever-process in this light, German writers now often speak of what they aptly call, "*das Heil-Fieber.*" Cantani himself quotes Boerhaave's question and answer—"Quid est febris? Est Naturæ irritatæ conamen ad expellandum stimulum inconsuetum," as well as Borsieri's words—"Quos interdum morbos remedia non curant, febris curat."

If we adopt this interpretation of the fever-process—and who can doubt its truth?—let us beware how we meddle with pyrexia in enteric fever. I am convinced that the wholesale exhibition of the fashionable antipyretics of the present day—acetanilid, phenacetin, phenazone, and so on—is fraught with risk. They open the floodgates of heat-discharge (thermolysis), while they seriously interfere with heat-production (thermogenesis), and so dangerous collapse is induced. These drugs, of course, may serve a useful purpose, when administered in small or moderate doses, in the treatment of enteric fever. They assuage the toxæmic rheumatoid pains of the disease, and so allay cerebral excitement and invite sleep. This is a great gain to the fever-stricken patient. But pushed so as to reduce temperature, they imperil life.

In the "water treatment" alone have we a safe and certain means of controlling or even reducing body-temperature in the febrile state. It is necessary here only to enumerate the various ways in which this method of treatment may be carried into effect:—

1. *Tepid sponging*, or mopping the surface of the body with a sponge squeezed out of tepid or warm water. This is usually grateful and refreshing to the patient, and reduces the surface-temperature from $1\cdot5^{\circ}$ to 2° F. It stimulates the cutaneous circulation, and so promotes general antipyresis. I was curious to find out whether the reduction of temperature after tepid sponging was merely a local surface-effect, or whether evidence

was forthcoming of a general constitutional defervescence. To test the matter, I had a series of observations made in the mouth under the supervision of the Staff-Sister in charge of the epidemic area of the Meath Hospital. Invariably the temperature fell in the mouth, as well as in the axilla, some $1^{\circ}5$ to 2° .

2. The *wet-pack*, as recommended and practised by Brand of Stettin.—Dr. Sydney Ringer advocates a modification of this method, namely, the continued application, from the chest downwards, of cloths wet with ice-cold water and wrung nearly dry. These are effectual means of reducing temperature with perfect safety.

3. *Immersion in cold baths* (temperature of the bath 70° to 50° F.) is practised on the Continent, and particularly in typhoid fever, unless intestinal haemorrhage threatens or is taking place. A prudent modification of this method was suggested many years ago by von Ziemssen—the initial temperature of the bath should be only some 10° below that of the body, but after the patient's immersion the bath should be gradually cooled down to 68° F. by adding cold water.

4. The *ice-cradle*, introduced by Dr. Samuel Fenwick at the London Hospital, has been used there for many years with satisfactory results.

5. In 1787 *cold affusion* was proposed by Dr. Currie, of Liverpool, both for arresting and for mitigating continued fevers.

6. The *ingestion of small quantities of cold water* at frequent intervals. Taken internally, as I have pointed out elsewhere,¹ water is the most effectual assuager of consuming thirst, the best and safest diuretic, diaphoretic, aperient, and eliminative we can prescribe. Cold water, sipped frequently, often allays delirium and induces sleep, in this way acting indirectly, as well as directly, as an antipyretic. Dr. H. C. Wood, in 1888, showed² that "while we cannot by water produce tissue-disintegration, we can by it wash out the retained products of tissue-change."

7. The *injection into the rectum* of small quantities of cold water will not only reduce temperature, but also overcome

¹ *Eruptive and Continued Fevers.* Dublin : Fannin & Co. 1892. Page 10.

² *Therapeutics : its Principles and Practice.*

constipation during the earlier stages of enteric fever. In the sloughing stage of the "typhoid ulcer" the use of warm-water enemata is safer, as they do not excite peristalsis when exhibited at blood-heat.

Akin to the water-treatment of pyrexia is the method of reducing bodily temperature in fever, and especially in enteric fever, by means of the *ambient air*. Dr. A. de Souza communicated a paper on this subject to *El Monitor Medico* for September 1886. In winter he would keep the sick-chamber at a temperature of from 8° to 10° C. (46·4° to 50° F.), the only bed-covering being a sheet and one blanket. Something extra is thrown over the feet towards dawn, should the temperature of the sick-room or of the patient fall considerably. In summer much may be done by proper ventilation and light bed-clothes.

In exceptional cases, quinine in full doses—5. or even 10 grains repeated at short intervals, until from 20 to 40 grains have been taken—is a favourite antipyretic, especially with German physicians. I have myself occasionally used it in this way, particularly in the later stages of the fever, when it assumes a remittent type. If the patient is conscious and can swallow a cachet, this is the handiest way of giving the drug; or it may be exhibited, together with 3 or 5 grains of powdered camphor, in milk.

Should persistent high temperature go hand in hand with wakefulness—a condition which itself increases feverishness—a hypodermic injection of morphine ($\frac{1}{2}$ to $\frac{1}{4}$ grain), strychnine ($\frac{1}{30}$ grain), and digitalin ($\frac{1}{100}$ grain) often invites sleep and lowers temperature.

IV.—MANAGEMENT OF THE BOWELS, AND INTESTINAL ANTISEPSIS.

The treatment of constipation in enteric fever is, to my mind, more difficult than the control of diarrhoea. Allusion has already been made to the necessity for opening the bowels with caution in the early stages of the fever. This object is best achieved by a small dose—1 to 3 grains, or even only half a grain—of calomel given at bedtime, and followed next morning by $7\frac{1}{2}$ grains of salicylate of sodium, with a drachm of effervescent citrate of caffeine in water; or a simple enema may

be administered. Later on, and after the eighth day, calomel seems to be contra-indicated, and had better be withheld, because of its power to increase peristalsis. The safest and best aperient then is castor oil given in teaspoonful doses with glycerine (1 fluid drachm) and 2 ounces of milk—this dose being repeated at intervals of six hours until the bowels act regularly. An alternative would be tablespoonful doses of the "Mistura Olei Ricini" of the British Pharmacopoeia of 1898.

Another mild and pleasant aperient is a flipped banana. It is easily prepared. A sound banana is peeled, placed in a small bowl or breakfast cup, crushed with a fork, and then whipped like an egg. Its cells are in this way broken, and a sweet, creamy emulsion is formed. Taken in the early morning, a flipped banana is an effective, yet gentle, laxative, and may safely be given at any stage of enteric fever. A glycerine compress applied over the abdomen also helps in the treatment of constipation, and checks meteorism or tympanites—that ominous and dangerous symptom—or the bowels may be kept moving by a simple, or a turpentine, enema as required. When diarrhoea is present, diet should be revised. Beef-tea should be stopped, as well as strained mutton-broth. Chicken-broth may be thickened with a little isinglass, arrowroot, or Groult's tapioca. Milk should be boiled, and, when cold, given with one-fourth to one-half its bulk of lime-water, or an equivalent proportion of saccharated solution of lime; or peptonised milk may be substituted; or, better still, equal parts of white-wine whey and egg-water (*i.e.*, the whites of 2 eggs beaten to a foam and mixed with a pint of cold water and strained).

As to medicines, we may employ freshly-prepared chalk-mixture, to each half-ounce dose of which may be added 10 minims of the compound tincture of chloroform of the British Pharmacopoeia of 1885, or—if the patient is in pain—a like quantity of tincture of chloroform and morphine. Half-an-ounce of the following mixture after each motion also soon checks diarrhoea, namely :—

R. Tincturæ chloroformi et morphinæ compositæ,
Glycerini acidi carbolici, $\frac{aa}{-}$ - - - - 3ij
Aqua menthæ piperitæ (vel cinnamomi), ad 3vj

M. Ft. mistura.

Salicylate of bismuth is an excellent remedy in the septic diarrhoea of the sloughing stage, and at any period in the fever small doses (10 minims) of turpentine given systematically every few hours control both diarrhoea and tympanites in a remarkable and most satisfactory fashion.

In this connection, let me recall a "Note on Salicylate of Quinine" which I communicated to THE PRACTITIONER for January, 1903. In enteric fever this drug seems to me to be far superior to salol or any of the other so-called intestinal disinfectants, the invaluable salicylate of bismuth not excepted. Given early in the disease—perhaps after a moderate dose of calomel has scavenged and disinfected the intestinal canal—and continued throughout the fever-movement or even into convalescence, quinine salicylate has appeared to regulate the bowels, correct the foetor of the evacuations, check tympanites, and control any tendency to vesical catarrh. Under the treatment, the fever has apparently run a mild and favourable course, the more serious complications of its later stages failing to appear save in rare instances. It may be given in 3-grain tablets, or in 5-grain doses in cachets. Occasionally symptoms of quinism have obliged us to stop the drug.

The last drug which I will mention is turpentine. It fulfils many indications in enteric fever. Not only is it an excellent diffusible stimulant and a valuable antiseptic, but it also relieves chest-complications, controls diarrhoea, checks meteorism, and stays intestinal haemorrhage. Turpentine is, therefore, one of the best all-round remedies we possess for the treatment of enteric fever. It is conveniently prescribed in capsules or perles containing 5 or 10 minims of either turpentine or terebene. Another good way of prescribing it is with spirit of nitrous ether as follows :—

R.	Spiritus terebinthinæ	-	-	-	-	3ij
	Spiritus ætheris nitrosi	-	-	-	-	3ij
	Spiritus chloroformi	-	-	-	-	3ij
	Misturæ amygdalæ, ad	-	-	-	-	3vi

M. Ft. mistura. Signa: Shake the bottle. Half-an-ounce for a dose.

Caution is necessary in the exhibition of turpentine in the presence of albuminuria, or when there is disease of the kidneys or bladder,

V.—INTESTINAL HÆMORRHAGE.

While it is always an alarming symptom, intestinal hæmorrhage is by no means necessarily followed by grave results. I have seen many cases of profuse intestinal hæmorrhage in enteric fever, and the impression left upon my mind is that an unexpected and surprising improvement in the patient's state sometimes follows a single copious bleeding, whereas repeated bleedings of less amount nearly always end in death. Should blood pass from the bowels in the third or fourth week, we naturally regard the symptom as a danger-signal, a warning of impending perforation. For the source of the hæmorrhage at that stage of enteric fever is almost certainly the blood-vessels running beneath the transverse muscular fibres of the intestine.

All authorities agree that the first and chief indication in intestinal hæmorrhage is *absolute rest*. This is secured by withholding food for several hours, or by giving only small quantities of whey and egg-water, and by the free exhibition of opium, preferably in the form of hypodermic injections of morphine. Ice may be sucked, and an ice-poultice, or a bladder containing broken pieces of ice, may be laid over the right side of the abdomen, as recommended by Murchison. The same excellent authority found the following mixture almost invariably effectual for stopping the bleeding :—

B. Acidi tannici, gr, 10;
Tincturæ opii, min. x;
Spiritus terebinthinæ, min. xv;
Mucilaginis acaciæ, 3ij;
Tinct. chloroformi comp., min. xx;
Aquæ menthæ piperitæ, ad 3j.

M. Ft. haustus, secundâ quâque horâ sumendus.

I suggest that from 10 to 15 or even 20 minims of the compound tincture of chloroform and morphine of the British Pharmacopœia of 1898 should take the place of the laudanum and compound tincture of chloroform in the above prescription.

When the hemorrhage is so profuse or continuous as to endanger life, we may adopt von Ziemssen's recommendation of ice-water enemata and rectal injections of blood or of salt water. In such cases, also, twenty-grain doses of chloride of calcium every few hours will do good, or adrenalin or cornutin

(Kobert) may be exhibited. The last-named is a powerful haemostatic, but is said to raise blood-pressure. The dose is one-sixth to a quarter of a grain daily, given in divided doses. The hydrochloride of cornutin is more soluble than the alkaloid itself, while the dose is the same.

VI.—PERFORATION.

The treatment of this deadly complication of enteric fever is at best a forlorn hope. "Pin-hole" perforation naturally gives the patient a better chance of life than rupture properly so called, when a ragged rent or tear at the excavated base of an ulcerated Peyer's patch that has sloughed allows a wholesale extravasation of the septic bowel-contents into the peritoneum.

Of late years interest has centred in the surgical treatment of perforation. I am indebted to my colleague, Mr. William Taylor, F.R.C.S.I., for the following abstract account of his personal experience in intestinal perforation at Cork Street Fever Hospital and at the Meath Hospital and County Dublin Infirmary. The cases are five in number :—

Case 1.—Mrs. C., aged about 37 years, was admitted into Cork Street Fever Hospital early in July, 1899, suffering from typhoid fever. She had had an abortion about three weeks prior to admission. Her attack was a severe one. Symptoms of intestinal obstruction developed during convalescence, for which the abdomen had to be opened on August 19. The condition found was a suppurating right ovary, and three localised deposits of pus in the mesentery from softening mesenteric glands. Relapse of the typhoid followed, with severe diarrhoea. On September 4 severe pain in the abdomen and vomiting again set in, with increasing rapidity of the pulse. Operation about eight hours later disclosed a perforation through the floor of a typhoid ulcer. This was closed with a single row of sutures. Death occurred fifteen days afterwards from a fresh perforation. The necropsy showed that the sutured ulcer was healed.

Case 2.—P. C., a man aged 52 years, was admitted into Meath Hospital under Dr. Lennon on June 11, 1901. He had been working as a cobbler until the day before admission ; and, though feeling unwell for a fortnight before this, he ate a chop.

some peas and potatoes, on the day before admission. Rose-spots were present. At 9 p.m. on the night after admission he complained of severe pain in the abdomen, which was followed by vomiting. When Dr. Lennon saw him the next morning, he diagnosticated perforation. Operation was performed at 12 noon, about fifteen hours after the onset of the pain. A perforation was found about 15 to 20 inches above the cæcum. This was closed with a purse-string suture, reinforced by a continuous Lembert suture. The abdomen was full of pus, and was washed out ; and the wound was closed, a small gauze drain being left leading down to the sutured intestine. Death occurred about ten or eleven hours later.

Case 3.—E. D., a woman aged 28, a very bad syphilitic subject, was admitted into Cork Street Hospital on December 31, 1902. She had been ill for about two weeks. She went to the North Dublin Union owing to the onset of severe pain in the abdomen and vomiting on the morning of December 31, and was sent from that institution to the Lock Hospital. From the latter she was sent to Cork Street, where she arrived late in the evening. She was seen by Mr. Taylor, after a telephoned message, on January 1, about 2 p.m. General peritonitis was evidently present ; he thought it might be the result of appendicitis. Operation was performed at 3 p.m. The abdomen was full of pus. A perforation of a typhoid ulcer was found about six inches from the cæcum. The opening was closed by a purse-string suture. The belly-cavity was irrigated and cleansed, and the wound closed, a tampon being placed in the pelvis and right iliac fossa. Antistreptococcic serum was given. Death took place about 51 hours later. At the necropsy, there was found extensive ulceration of the intestine : there was no fresh accumulation of pus, or evidence of further peritonitis.

Case 4.—J. H., a man aged 21 years, was admitted into Cork Street Hospital on August 4, 1903, suffering from a severe attack of enteric fever. He had been ill for 12 days prior to admission. Symptoms of perforation were observed at 9 a.m. on the 6th. He was seen by Mr. Taylor at 3 p.m., his pulse was then 150 per minute, and very feeble. It seemed doubtful whether he could stand an operation, but at 3.30 the abdomen was opened, to give him a chance, under ether. A small

perforation was found, 16 to 18 inches from the cæcum. This was closed by a purse-string suture, reinforced by a continuous Lembert. A second ulcer was just about to perforate, about 12 to 14 inches higher up : this was infolded by a purse-string suture. The abdomen, which was full of thin pus, was freely irrigated with saline solution, and the wound was closed without drainage. The operation lasted only 21 minutes. Except that the edges of the wound suppurated, the patient had no bad symptoms. His temperature remained normal after the first week, and he rapidly recovered. When completely convalescent, five weeks after the operation, this patient developed acute intestinal obstruction. He was seen by Mr. Taylor on the fourth day, and the abdomen was opened. There were extensive adhesions of the intestines to one another all over the abdomen. These were separated, the contents of the gut were evacuated, and the abdomen was closed. Death took place about 12 hours later. The necropsy showed complete healing of both the ulcers which had been sutured : the mucous membrane completely covered them in, and the only evidence of their sites consisted in the lines of silk sutures outside.

Case 5.—F. B., a boy aged 12 years, was admitted into Cork Street Hospital on August 21, 1903. He had been ill for nine days before admission, and when seen was delirious, and suffering from a very severe attack. On September 15 at 9 p.m. he complained of pains in the abdomen, which was followed by vomiting. He was seen by Mr. Taylor for the first time at 1.45 a.m. on the 17th, 28½ hours after the onset of the pain. The abdomen was opened at 2 a.m. General peritonitis was found, the abdomen being full of pus ; and a perforation was discovered in the appendix vermiciformis. This was removed. Free irrigation was employed, and the abdomen was closed, a tampon being placed in the pelvis and a second in the right iliac region. Death occurred at 10.30 p.m. on the 18th, that is about 44 hours after operation.

VII.—DIET IN THE CLOSING STAGES OF THE FEVER.

All physicians will agree that the management of the convalescent enteric-fever patient in regard to diet is one of the most difficult problems in the whole range of the practice of

medicine. "No solid food," said the late Dr. Hilton Fagge, "should be given for a fortnight after fever and diarrhoea have ceased. The patient will bitterly complain of the restriction; but if the physician has once lost a patient from perforation during convalescence, he will be inexorable ever after. Progress to health after this disease must be slow if it is to be sure."

"Notwithstanding the cravings of the patient's appetite," wrote Charles Murchison, "the diet must be at first restricted to such articles as milk, eggs, farinacea, custards, light puddings, beef-tea, chicken-tea, or calf's-foot jelly. Meat ought not to be allowed for at least seven days after the cessation of pyrexia, and not even then if there be any signs of intestinal disturbance; and before meat is given it is well to try for a day or two a piece of boiled sole, smelt, or whiting."

Even fish, however, does not always agree with a convalescent from enteric fever. It sometimes appears to produce poisonous effects, although apparently in good condition. I have known this to occur in more than one case, the fish eaten being a fresh sole, to all appearance perfectly sound.

In a case observed at the beginning of the present session, a very sparing meal of chicken on the forty-eighth day of the fever led to a rise of temperature to 102° F., abdominal pain, and the passage of motions containing small lumps of undigested chicken-flesh. The patient had not been entirely fever-free when she partook of the meal which so thoroughly disagreed with her, for her evening temperatures for six nights previously had been on the average 100° 1°.

"Convalescents from typhoid fever," says William Osler, "frequently cause greater anxiety than patients in the attack. The question of food has to be met at once, as the patient acquires a ravenous appetite and clamours for a fuller diet. My custom has been not to allow solid food until the temperature has been normal for ten days. This is, I think, a safe rule, leaning, perhaps, to the side of extreme caution; but, after all, with eggs, milk toast, milk puddings, and jellies, the patient can take a fairly varied diet." Osler had "a lesson," as he himself says, in this matter which he has never forgotten. A young lad in the Montreal General Hospital passed through a tolerably sharp attack of enteric fever. Two weeks after the evening temperature had been normal, and only a day or two before

his intended discharge he ate several mutton chops. Within twenty-four hours he was in a state of collapse from perforation. A small transverse rent was found at the bottom of an ulcer which was in process of healing.

A very pressing—though happily a rare—danger in convalescence is heart-failure, due to peripheral neuritis, as in diphtheria, or to hyaline degeneration of the cardiac muscle, as in typhus. Strychnine, especially administered hypodermically, is a sheet anchor in this emergency. The patients, also must be kept in the recumbent posture. If they must needs get out of bed to the night-chair, a teaspoonful of whisky or brandy with three teaspoonfuls of warm water should first be given. Nor should they be left alone for an instant. It is in such circumstances that embolic infarction of the mesentery is likely to occur—an accident which is quickly followed by necrosis or gangrene of the intestine, paralytic arrest of peristalsis, and death.

In conclusion, may I claim the privilege of advancing years and a riper experience to warn young physicians against the perilous error of adopting a routine treatment of enteric fever, particularly in the matter of alcoholic stimulants. It is one thing to treat a disease, it is quite another thing to treat a patient suffering from that disease. As I have written elsewhere, "the attitude of the physician who is in attendance upon a patient in enteric fever should be that of watchful, intelligent, and armed expectancy."¹ I am of a truth convinced that great risk arises to many a fever patient from a fussy, nervous, over-zealous interference on the part of the physician. We should not forget that enteric fever is a self-limited disease, which in perhaps a majority of cases tends to run its appointed periodic course without mishap, the essential symptoms having "kept the noiseless tenor of their way." There is, in fact, no malady in which it is so desirable to avoid what has been well termed the "*nimia diligentia Medici.*"

¹ *Eruptive and Continued Fevers*, 1892, page 449.



THE TREATMENT OF ENTERIC FEVER.

BY HERBERT P. HAWKINS, M.A., M.D. (OXON.), F.R.C.P. (LOND.).

Physician to St. Thomas's Hospital.

THE treatment of enteric fever rests broadly on a clear appreciation of the various ways, such as peritonitis, haemorrhage and toxæmia, by which death can come. It is as much preventive as curative. Danger to life comes quickly on the scene in any case, and something can be done to avert it. But if a man will have a low death-rate on his hands, he must expect to reach it by keeping the occurrence of complications down to a low level, rather than by saving life when they occur. There is no specific remedy. If the prompt dealing with perforation be excepted, the treatment presents no striking feature. It consists mainly in attention to detail.

There is no disease in which good nursing is of such importance. Food, cleanliness, protection of skin, attention to the mouth, enemata, bathing, and recording of temperature, pulse and sleep, will afford ample work for two skilled nurses. If a choice of rooms is possible, that which is largest and admits of the best ventilation and the greatest quiet should be chosen. It should be kept at a temperature of 60° F. Anyone who receives permission to visit the patient should be made to understand the transference of infective material by the hands to the mouth. Stools and urine should be allowed to stand for some hours in contact with carbolic acid of such strength that the acid forms at least 1 in 40 of the total mixture, before being sent down the drains. Chloride of lime (1 in 500) and izal (1 in 200) are alternatives. Perchloride of mercury is ineffective for this purpose.

FEEDING.

The matter of feeding is of the first importance, and in the mildest type of case little else is required. Digestion both of proteid and carbohydrate is impaired, and in every case there is always before us the possibility that in one or more ulcers the floor consists of little more than the peritoneal tissue. With

these two points in view, milk is universally recognised as the appropriate food. A minimum of 50 and a maximum of 70 ounces of milk *per diem* may be laid down for the use of an adult. More than this is unnecessary, and few patients can dispose of the curd of a larger amount. We are more likely to err by giving too much than too little. It should be diluted to the extent of one part in four with barley-water, lime-water, or soda-water ; an ounce of glucose is sometimes added. It should be given at regular intervals, 6 to 10 ounces of the mixture every two hours for 9 or 10 doses, so that when possible an interval of four to six hours may be left for undisturbed sleep. In some cases the milk-diet is better borne, if half this amount is given every hour for 18 or 20 doses. Sleep is as necessary as food. The question of the relative need for food and sleep must often be left to the discretion of the nurse, as it will vary from day to day. In severe cases it may be wiser to rouse the patient for food or stimulant every hour day and night. The milk should not be given merely to quench thirst ; but, if necessary, water or barley-water may be allowed freely between the meals. If there is real difficulty in digesting milk, and curd appears in the stools, it must be peptonised.

Some few patients soon revolt from the milk-diet. Much depends, then, on the tact of the nurse. It may be necessary to flavour the milk with tea or coffee, or to give some of it in the form of jelly flavoured with lemon (one ounce of isinglass to a pint of milk and half a pint of cream), or as a milk-soup flavoured with vegetables. The dislike to milk may be so real and strong that only a part of the required amount can be taken. The part withdrawn must be replaced by whey flavoured with coffee or lemon, albumen-water (whites of two eggs in a pint of water with an ounce of brandy and a little salt), egg-flip, or less satisfactorily by meat-broth or meat-jellies. In many cases, even when milk is taken uncomplainingly, it is well to use these adjuncts occasionally as a change, replacing a dose of milk.

Alcohol should be used as a medicine, and it is, therefore, not always necessary. The rate and strength of the pulse form the guide for its use. In most cases a daily allowance of three or four ounces of whisky or brandy is required at the height of the disease, and when the heart is clearly failing, and

the poisoning, as marked by stupor, delirium, and twitching, is profound, eight or ten ounces may be given. In alcoholic subjects, and in old people, it should be used from the first.

SPECIAL SYMPTOMS.

Vomiting is occasionally troublesome, and it may be dangerous if it occurs at a time when the patient's strength is already at a low ebb. It can generally be stopped by a few doses of bismuth subnitrate with five minims of liq. morphinæ in each, and the application of mustard or hot fomentations to the epigastrium, while the milk is somewhat reduced in quantity, or even replaced for a day or two by whey and albumen-water. Sometimes, however, it continues uncontrolled; and it may then be necessary, whatever stage the illness may have reached, to stop all food by the mouth for a time, and to use nutrient enemata, the mouth-feeding being begun again tentatively with half-ounce doses of peptonised milk. The vomiting appears to be due to a gastric catarrh. It is obvious that care must be taken to assure oneself that it does not indicate peritonitis.

As regards the *action of the bowels*, if there is constipation a simple enema should be given every third day, and no purgative is admissible from first to last. The use of aperient medicines, especially castor oil, still retains a few advocates. There is this apparent reason for their use, that the small intestine is thereby cleared, which is an obvious advantage over the emptying of the lower bowel by an enema. But there is this greater reason against their use, that, when extensive deep ulceration is present, the patient's life may depend on restraining rather than exciting peristalsis. If no peristalsis is excited, the purgative is useless. Moreover, it is by no means certain that a forcible clearance of the small intestine is an unmixed advantage. Such a clearance cannot cut short the illness by a single day. As regards the absorption of toxines, the use of a purgative may as reasonably be credited with increasing as with diminishing it, for the seat of the toxine-production is in the substance of the bowel-wall, the mesenteric glands and the spleen, and not on the free surface of the mucosa. And further, if a natural purgation or diarrhoea occurs, we are taught by experience to take prompt measures

to check it. The old practice of giving calomel during the first week of the illness has more to recommend it ; but this also is not free from danger, unless the exact date of the onset is known and the precise state of the intestine can be estimated. In many cases constipation continues during the whole illness, and the routine use of enemata must be maintained throughout. Such cases are usually most favourable. Most men believe in the wisdom of the old recommendation to "lock up the bowels and keep them so."

If there is any tendency to diarrhoea, the feeding must be overhauled, and altered or reduced, if necessary, and energetic treatment should be adopted at once. However it may be caused, whether by error of feeding, by general rise of bacterial virulence throughout the intestine, or by the depth and extent of the ulceration, diarrhoea is dangerous, and it is not to be regarded as a helpful eliminative process. It may appear suddenly ; and after three weeks of mild illness with constipation, the bowels may be moved several times in quick succession, and the aspect of affairs at once changes. The danger of it lies in the undue hurrying of food along the intestine, and in the risk either of the premature detachment of necrosed tissue, so that haemorrhage or perforation may result, or of the tearing of a linear rent in the thin floor of an ulcer. There is safety in the slough, and its separation should be a gradual process. Opium in some form is the only efficient remedy. In slight cases the starch-and-opium enema is sufficient. In more severe cases Dover's powder in doses of ten grains may be used, or, better still, Dover's powder with 25 grains of bismuth subnitrate. In urgent cases and when administration by mouth is not advisable, morphine must be used hypodermically. The same line of treatment applies to the abdominal pain, which is occasionally a marked feature of the illness, and may occur apart from any complication.

Meteorism or distension of the bowel with gas is always a grave sign, as it is particularly in such cases that perforation or haemorrhage is likely to occur. It is often associated with the frequent, half-involuntary passage of small liquid offensive stools. Something can be attempted, but little can be effected by the passing of a long tube up the rectum, by turpentine enemata or turpentine stupes to the abdomen. A more rational

treatment employs one of the disinfectant drugs, of which carbolic acid is the most likely to prove of use.

MEDICINAL TREATMENT.

Many patients favoured by a steady constipation plod through the three or four weeks of illness without presenting any unfavourable symptom which really needs medicinal treatment. In such cases, if medicine is used, dilute hydrochloric acid with tincture or syrup of orange is as pleasant to the patient as anything else, and quinine can be added, if desired. No specific antitoxic serum has been produced which can be said to influence the course of the illness, and in the absence of such a serum, no routine medicinal treatment can be laid down. Certainly drugs should not be used for the purpose of reducing the temperature, when cold water can be obtained. A more legitimate aim is the control of intestinal bacteria. When, and to what extent, our feeble bactericidal agents are worth using, is a question which each man must settle for himself. Few will suppose that such agents can influence the sheltered typhoid-bacillus. But if the aim is against the loose-swarming normal bacteria, there is much to be said in favour of their use. In the post-mortem room, in severe cases at any rate, the whole length of the bowel shows an acute catarrhal inflammation with shedding of epithelium, and even abrasions of the mucosa, and in such cases the contents of the bowel are commonly putrid. And when during the progress of a case the stools become loose and offensive, while the intestine becomes distended with gas, there is a reasonable opening for the use of some disinfectant drug. It may be argued that, if such drugs have a controlling effect on bacterial growth, it is wiser to be beforehand and to use them rather as a routine preventive than as a curative agent. This plan is often adopted from the beginning of the illness. Such drugs are many and inefficient. Salol, salicylate of bismuth, guaiacol, β -naphthol, and sulpho-carbolate of soda are among them. Sulphurous acid has advocates. Murchison had faith in chlorine-water. Carbolic acid is largely used, and certainly the stools may become comparatively inoffensive and distension may subside under its use. Given in the following way it is distinctly palatable: Rx. Ac. carbol., m. 3; Tinct. chlorof. co., m. 10;

Tinct. cardam. co., ℥. 10; Syr. aurant., ℥. 40; Aq. chlorof. ad. ʒi.; to be taken with an equal amount of iced water four or five times a day immediately after food. Nothing should be used that is likely to increase peristalsis, and calomel and perchloride of mercury come under this head.

The amount of *sleep* obtained in the 24 hours should be noted. For insomnia and restlessness Dover's powder in 5- or 10-grain doses has the surest action. Heroin also is of use. It is a good plan, irrespective of temperature, to arrange for a sponging with water at 80° F. about 10 p.m., which by itself tends to allay restlessness, and so enables one to use a smaller dose of hypnotic. An ice-cap or an evaporating lotion will be of use for the headache which may be severe in the early part of the illness.

CONTROL OF PYREXIA.

The continuance of a body-temperature averaging 103° F. for three, four, or more weeks is a definite tendency to death, which can be greatly diminished. It is probable that much of the injurious effect, especially on nerve-tissue and cardiac muscle, which was formerly regarded as due to the pyrexia alone, should more correctly be ascribed to the toxæmia. But we may safely believe that with a lower average daily temperature, the greater will be the conservation of the tissue-resistance to bacterial life and activity. There may be cases and conditions in which an occasional dose of quinine, phenacetin, antipyrin, or salicylate of soda may be used. But the attempt to control pyrexia throughout a long illness by drugs has nothing to recommend it. Such a method is usually inefficient, and if it is to have a substantial effect, it must be carried out on a scale that is not free from danger. There is nothing like cold water, which may be used in different ways.

(1) *Sponging*.—The patient should lie stripped on a blanket, and be covered to the chin with a blanket. The face, forehead and neck are slowly sponged over with water at the supply-tap temperature, and the eyes are dried. Each arm axilla and side of chest are similarly treated, only one part being exposed at a time, and being on completion immediately returned to the cover of the blanket without drying. Chest,

epigastrium, lower extremities and back are each treated in turn in the order named. The whole body should be thus sponged in ten minutes. The temperature is then taken. If the required effect has been produced and a drop of three or four degrees has occurred, the lower blanket is removed, and the patient is wrapped in the upper blanket, which should have been kept dry. There is no necessity to dry the general surface, but the prominent points of the back, scapulæ, sacrum and hips must be carefully dried and powdered on each occasion. If the required effect has not been produced, the sponging must be repeated for a second period of ten minutes with water reduced to a temperature of 40° F. or 50° F. by ice. It is well to sponge thus in two stages, because the amount of effect produced cannot be foreseen. In some patients, especially young subjects, sponging for ten minutes at 60° F. will bring the temperature down from 104° F. to 98° F. In others the effect is trifling, and the second sponging with iced water becomes necessary.

(2.) *The Cold Pack.*—This is a poor substitute for sponging, but it requires less skill. The patient being placed on a blanket on a mackintosh sheet, is wrapped from neck to feet in a sheet wrung out of water at 60° F. (or lower if a greater effect is required), and is so kept for fifteen minutes while cold water is sprinkled over him. He is then hastily dried and placed between dry blankets.

(3.) *The Cold Bath.*—Unless a special apparatus with pulleys is available, by which the patient may be raised from the bed and shifted laterally, he must be swung in a sheet into the bath which is brought to the bedside. He should be able to lie at full length in it immersed up to the chin, with the head comfortably supported. The temperature of the water should not be higher than 80° F., if much effect is to be produced ; and frequently a temperature of 70° F. is necessary, and perfectly safe. He should be immersed for 15 or 20 minutes, but always under competent supervision. On removal he is enveloped in a dry blanket. Some blueness and shivering may often be seen, but they are usually of short duration. If there is any real collapse, as indicated by the pulse, some stimulant may be given and the limbs rubbed.

The great value of the antipyretic use of cold water is placed beyond doubt by statistics from all countries. As compared with cases under drug-treatment, or under no treatment, the mortality is reduced by 7 or 8 per cent. The reduction occurs in deaths which must be credited to toxæmia and pyrexia, while the mortality from perforation and hæmorrhage is but little altered. Murchison's mortality-rate was 3 per cent. from perforation, 1·4 per cent. from hæmorrhage, and 12·6 per cent. from other causes; while Hare's figures, with the bath-treatment, are under the same classification, 2·9, 1·2, and 3·4 per cent. respectively.

Views differ as to the degree of the patient's temperature at which some hydro-therapeutic measure must be taken to reduce it. In the strictest school 102·5° F. is taken as the signal, and in that case baths or sponging become exceedingly frequent. Commonly 103° F. is the point arbitrarily fixed upon, and sometimes even half a degree higher. The routine use of the bath 5 or 6 times a day without regard to temperature is sometimes adopted.

The choice between sponging and the bath depends mainly on the position of the patient, and partly on the character of his relations. The bath is best suited for the hospital, and sponging for private use. On the score of efficiency there is no difference between the two methods. Any required reduction of temperature can be obtained by either of them, and the reduction is as lasting in the one as the other. In spite of this apparent equality between the two methods, many men believe in the superiority of the bath. There is a certain difference between them, in that the effect of the bath is sudden as compared with the gradual sponging. And it is possible that the general cutaneous stimulation, which results in far greater measure from the bath than from mere sponging, may have by itself a beneficial influence upon the cardiac and respiratory mechanisms. Such influence, if it exists, is in favour of the bath. Sponging, however, has the advantage of being more generally applicable. It entails less disturbance of the patient. He likes the comfort of sponging, and is not always enthusiastic about the bath. Moreover, sponging alone can be undertaken in the presence of any cardiac failure, hæmorrhage, abdominal pain, or phlebitis.

HÆMORRHAGE.

The appearance of blood in the stools must always mean the necessity for keeping the whole body, and the bowel in particular, at rest. Of course a few streaks or small clots of blood may often be seen during the stage of slough-separation, and yet no severe haemorrhage occurs. But serious haemorrhage is so often preceded by such slight indications that it is wise to be beforehand. Bodily movement should be prevented as far as possible, and the patient should do nothing for himself. The bed-pan should not be used, but the buttocks should be packed round with carbolised tow, into which all evacuations may be passed. Opium in some form is the best remedy. In urgent cases morphine hypodermically comes first. In less severe cases Dover's powder, the lead-and-opium pill, or starch-and-opium enemata may be used. But in all cases the aim is to give enough opium to prevent peristaltic action for the few days over which the danger extends. The resulting constipation can be dealt with by enemata after three or four days have passed without bleeding. It is doubtful whether any more specific remedy than opium need be used, but turpentine, tannic acid, and ergot or ergotinine have their advocates. It is not probable that adrenalin will prove to be of service in this form of haemorrhage. Murchison used the following mixture:—Ac. tannic., gr. 10; Tinct. opii, ℥ 10; Spt. terebinth, ℥ 15; Mucil., ʒii.; Tinct. chlorof. co., ℥ 20; Aq. menth. Pip. ad ʒi. every two hours.

The question of giving stimulant after severe haemorrhage will often come up for decision. Each case must be decided on its merits. It is best to withhold it as long as possible, for there is considerable risk in raising the blood-pressure, when there is an opening in a vessel only lightly glazed over. If the patient is blanched and in imminent danger of dying from sheer loss of blood, infusion of normal saline solution (roughly a teaspoonful of salt in a pint of sterilised water) should be employed, either by the intravenous method or preferably into the areolar tissue of the flank or the side of chest by gravity. By the latter method a pint can be given in ten minutes.

PERFORATION.

When perforation occurs laparotomy should be performed without the slightest delay. There should be no hesitation,

except on the ground of doubt as to whether the patient can stand the operation. Even twenty-four hours after perforation a successful result can be obtained. The recovery-rate may be placed now at about 25 per cent. of cases submitted to operation, and doubtless this still admits of improvement. It may be taken as certain that without operation recovery is impossible. In patients who are already extremely ill, especially in those who with a tensely-distended abdomen are hardly capable of feeling or expressing a sense of pain, there is great difficulty in recognising with promptitude and certainty the occurrence of perforation. Sometimes perforation and peritonitis are found in the post-mortem room, but in looking back at the case we cannot be wise even after the event, and we fail to detect any sudden sign or symptom which ought to have attracted attention as indicating the onset of this complication. Much depends on the alertness of the physician and his readiness to obtain surgical aid. Perforation in typhoid fever is so uniformly fatal, that, even when a certain diagnosis cannot be made, a strong suspicion of its occurrence, if entertained by a competent man, does by itself require an exploration, which may be performed under local anaesthesia.

THE HEART AND LUNGS.

All through the course of the illness the state of the *heart* must be watched, and the pulse-rate should be recorded twice a day. A rate persistently above 120 is a bad sign and needs early treatment. The cardiac failure, which is one of the immediate causes of death, must be attributed as much to the toxæmia as to the continued fever. Having no antitoxic serum, we are unable to attack it at its source. We must be content to endeavour to tide over the dangerous period by the use of alcohol, strychnia, and with less prospect of benefit, digitalis. Strychnia has the advantage of lending itself to hypodermic use, and it may be used freely up to one-tenth of a grain two or three times a day in an adult. But it must be used with care and supervision, for in large doses it often produces restlessness and insomnia, which detract considerably from its good effect upon the cardiac action. In many cases, especially where the patient without presenting any acute symptoms lies apathetic, motionless, and muttering, with a

rapid pulse which is difficult to count and even to feel, he may be infused with advantage, and this repeatedly.

Some *bronchitis* affecting the larger tubes is a part of the specific disease. Hypostatic crepitation over the lower hand-breadth of the base of one or both lungs is common enough. As a rule, no special treatment is required. Occasionally, however, the bronchitis assumes larger proportions, the small tubes become affected, and piping rhonchi and large-sized crepitations are heard over the whole of both lungs. The patient is distressed and cyanosed ; and if he were seen in this state for the first time, a capillary bronchitis might be recognised, while the specific fever is overlooked. A similar error is not uncommon when the lung-complication takes the form of a definite lobar pneumonia. Both states, bronchitic and pneumonic, are grave matters, and will usually turn the scale against the patient, if the heart has already begun to fail. If the heart is failing fast, the only chance lies in the use of strychnia, stimulants such as alcohol and ammonium carbonate, and continuous inhalation of oxygen. Cases, however, occur in which the state of the heart permits abstraction of blood, and if the physician is his own master, the patient may be bled from the arm with advantage. It may not save him, for the good effect is temporary and cannot be obtained a second time to the like extent. A smaller step in the right direction is the application of 8 or 10 leeches to the chest, and failing this, we must fall back on dry cupping and the free use of mustard and linseed.

CONVALESCENCE.

When the temperature after the usual oscillation has come to rest at the normal or a sub-normal point, convalescence begins, though the patient must remain under observation. The temperature must be recorded for the next three weeks. It is well to be on the safe side, and not to allow an extension of the diet until the temperature has remained normal or sub-normal for a week. Carbohydrates and eggs may then be added and considerable variety can be obtained. This precaution is necessary, not because there is any evidence that more solid food can provoke a relapse, but because it is known that one or more ulcers may lag behind the others in healing,

and may remain dangerously deep for several days without pyrexia. Care should be exercised particularly when the tongue remains furred. If a second week passes without any sign of fresh trouble, the diet can rapidly be brought up to the patient's expectation with fish, chicken and vegetables.

If constipation persists, enemata should be continued at least through the first ten days of normal temperature. Thereafter small doses of castor-oil are safe and efficient. Occasionally a tendency to diarrhoea continues far into convalescence, and it may need some simple treatment. The patient should not be allowed out of bed until at least a fortnight of normal temperature has elapsed.

In a small number of cases further troubles may yet ensue. It is sufficient to recognise their existence and know their meaning, and the treatment follows on general principles. The odd bouts of fever that may occur on no obvious provocation or on such slight provocation as a change of diet, an unusually copious action of the bowels or some unwonted emotion, need no treatment. But if they at all resemble a relapse, the precaution should be taken of treating them as such. The post-typhoid rigors need cause no alarm. The continuance of slight pyrexia for long after all signs of the specific fever have disappeared should be met by a full diet and tonics. Disease of bone (the ribs and tibiae being particularly liable) and of joints as a rule needs radical treatment by the surgeon. Thrombosis of veins, ear-disease, neuritis, cholecystitis, and the post-typhoid neurasthenic state require no special description.



ON THE IMPORTANCE OF AN EARLY DIAGNOSIS OF PERFORATION IN TYPHOID FEVER.

By HECTOR MACKENZIE, M.D., F.R.C.P.,

Physician and Lecturer on Pharmacology and Therapeutics, St. Thomas's Hospital.

THE saving of lives from death by the terribly fatal complication of perforation of the bowel in typhoid fever is the object which I have at heart in making this brief communication. I regard it as of the utmost consequence that every practitioner who may be called on to treat a case of typhoid fever should be fully alive to the risk of perforation and keep a sharp look-out for those symptoms and signs, by the observation of which it is alone possible to arrive at an early diagnosis. With a timely diagnosis there may be hope that surgical treatment will save the patient's life; without it there can be practically none. But the surgical treatment must be prompt, if it is to be effectual. Therefore, I would urge, as Dr. Oswald Baker has done before me, that in every case of typhoid fever the practitioner should, from the time he takes it in hand, be fully prepared to give the patient the benefit of prompt surgical treatment, should this usually disastrous accident of perforation unfortunately befall him.

Many lives in the course of every year are lost through this accident, for it is one of no infrequent occurrence. The experience of our London hospitals during the last decade shows that more than a fourth of all the deaths from typhoid arise from this cause, and more than 3 per cent. of all who are attacked by the disease lose their lives in this way. The accident is one which in any individual case we can neither foresee nor guard against. It may happen in the very mildest form of the disease no less than in cases of a severe type. Indeed about half the total number of cases of perforation are met with among comparatively mild forms of the disease. The danger of perforation is present throughout the whole of the illness. It commences with the onset, and is not over until complete recovery has taken place. Perforation may occur

before the patient feels ill enough to go to bed, or during convalescence, when all danger seems past. The greatest risk, however, is during the second, third, and fourth weeks of the illness.

Until recent years the accident was almost invariably fatal. Medical treatment is admittedly of no avail in perforation of the intestines, and it mattered, therefore, nothing to the patient whether the doctor recognised the complication or not. It is, however, different nowadays. It has been conclusively proved that lives can be saved by surgical treatment. In two cases last year in my own practice at St. Thomas's Hospital, fully reported in the *Lancet*, September 26, 1903, perforation occurred during the height of the illness, and the lives of both patients were saved by timely operation performed by my colleague, Mr. Battle. At the Johns Hopkins Hospital six lives have been saved out of eighteen operated on. Thirty-seven recoveries out of one hundred and fifty-eight operated on have been reported by Dr. W. W. Keen. What can be done in hospital can surely be done in the case of private patients. But to this end the practitioner must recognise the accident early, and he must have made his preparations for operation in advance.

It is not to be questioned that there are cases in which a diagnosis of perforation either cannot be made at all or can only be made when it is too late to save the patient's life by operation, even with the most constant vigilance and the most careful observation. But I have no hesitation in saying that in a large proportion of the cases a careful observer will be able to recognise the accident early; and the complication being recognised, the logical conclusion is, to attempt to save the patient's life by operation. The only contra-indication to operation is, as Finney maintains, a moribund condition of the patient.

What, then, are the symptoms and signs on which one depends for making an early diagnosis of perforation? Abdominal pain is by far the most important of the early symptoms of perforation, and it may be the only one. The pain usually comes on suddenly, is probably severe and persistent, and is most commonly referred to the lower half of the abdomen. A complaint of abdominal pain should be considered

as a most important danger-signal. Vomiting, nausea, hic-cough, action of the bowels repeated at short intervals, a rigor, sweating, mental excitement, or the symptoms of collapse, may any of them precede, accompany, or quickly follow the onset of pain. On the occurrence of pain or any of the other symptoms mentioned, the doctor in charge should at once be communicated with, the nurses in attendance having explicit instructions to that effect.

The doctor, when summoned, will carefully examine the patient. If perforation have occurred, then it is probable that he will find certain confirmatory signs, general and local.

(1.) There may be a change in the temperature, either a sudden drop or a sudden rise, or a drop followed by a rise, or a rise followed by a drop. A steady temperature, however, for a few hours does not negative perforation.

(2.) There may be a change in the pulse, which usually, soon after perforation, becomes more frequent and weaker. It is highly significant, if the pulse during the few hours following the attack of pain becomes more rapid, running, and feeble. Nevertheless, increased rapidity does not invariably follow within a few hours.

(3.) There may be a change in the facies. The development of a pinched or drawn look, depression of the angles of mouth, sinking in of the eyes, blueness of the lips, and sweating, are important changes which may occur.

Still more important and significant are the local signs which may be discovered on examination of the abdomen. Thus there may be found to be :—

(a) Tenderness of the abdomen on palpation. This may be general, but is usually most marked over the lower half.

(b) Rigidity or resistance of the abdominal walls. The abdomen may be retracted, or it may be distended ; but in either case there will probably be rigidity or resistance of the walls. This is a very important sign. The presence of softness or flaccidity is always reassuring.

(c) Obliteration of liver-dulness. This is a valuable sign if present ; although not always free from ambiguity, it is highly confirmatory of the diagnosis of perforation of a hollow viscus.

(d) Shifting dulness in the flanks, pointing to the presence of free fluid in the peritoneal cavity.

R
V
Re
er
a
le
sing
ne
Per
Satic
V
~~Dep~~
~~Abd~~
~~syn~~
~~T~~

THE TREATMENT OF TYPHOID FEVER IN THE JOHNS HOPKINS' HOSPITAL.*

By THOMAS McCRAE, M.D., M.R.C.P. (LOND.).

*Associate in Medicine, the Johns Hopkins University; and Resident Physician,
the Johns Hopkins Hospital.*

IN the treatment of typhoid fever our duty falls under two heads—first, that to the patient; and second, that to the community. Too often are we satisfied with the correct performance of the first; the patient is brought safely through a severe attack, and our work seems well done. So far as the patient is concerned, this is true; but what of the other duty, equally important, to ensure such thorough disinfection as will place beyond possibility any contagion from him? Emphasis cannot be too strongly laid on the fact that it is just as necessary to attend to the prevention of infection from a typhoid patient as it is to bring him through the attack. It may mean much saving of life in the end. The occurrence of typhoid fever would be rapidly reduced, did we thoroughly carry out disinfection in every case.

There can be little doubt that typhoid fever should be a hospital-treated disease, whenever possible. The need of constant care, the heavy work demanded, the value of early and accurate recognition of complications, and above all the greater certainty of thorough disinfection of all excreta, need only be mentioned to bring conviction of this. Many cases, especially in the country, must be treated at home; but here even more heavily rests the responsibility of preventing the possibility of further infection.

In a hospital the work required to treat, say, one hundred typhoid patients a year is enormous. In any method of treatment efficiency must be the first consideration, but simplicity should also be kept in mind. In every clinic various modifications are adopted. The essential features of the handling of typhoid fever in Professor Osler's clinic are described in this

The Brand or "bath" treatment is carried out as a rule

* From the Clinic of Professor Osler.

The main points in the treatment of ordinary cases may be taken up under—(1) dietary, (2) the baths, (3) general management, and (4) complications. Rest in bed is a strict rule ; the patients are not allowed to get up to use the bed-pan, nor do they step into the baths.

I.—DIET.

This, as a rule, is very simple and consists of milk and albumen-water given alternately every two hours. Whey is used frequently in place of the milk. As a rule, an adult receives four ounces of milk every four hours. This is diluted with two ounces of lime-water. In some cases equal amounts may be given, or a little bicarbonate of soda is added to the milk. Four ounces of albumen-water made from the white of one or two eggs is given alternately with the milk : it is usually flavoured with a little lemon- or orange-juice, and sugar is added, if desired. This forms a very palatable drink. The great majority of our patients go through the febrile period on this diet alone. When any change is necessary, it usually consists in reducing the amount of milk or cutting it off altogether. This is done, for example, in cases where curds are passed in the stools, or where there is much distension. When milk is cut off, the white of two or three eggs is given every two hours. We have very few patients who are unable to take milk. For these some modification may be used, such as buttermilk, boiled milk, peptonised milk, or koumiss ; or some flavouring, such as vanilla, may be added as a variation. Whey is specially useful in such cases : we use it frequently and can testify to its value.

Such a diet is very simple, reduces the work of feeding to a minimum, and is good for the patient. With it digestive disturbances are rare. Then, too, it is a diet which can be given anywhere—in a cottage as well as in a hospital. It combines simplicity, efficiency, and cheapness—this last consideration being often of no little importance.

For some patients other things are added. Ice-cream may be taken at any time. Tea or coffee may be given (iced weak tea is often grateful), and cocoa in some cases. Bouillon and clear soups may be helpful ; but as a rule these are not used, especially if there be any intestinal disturbance, and the majority of patients go through the attack on milk, whey and

albumen-water. Beef-tea, peptonoids and similar preparations are never given. If a change of diet is required, it is usually to reduce or cut off the milk and give only whey and albumen. More typhoid patients are over- than under-fed. The experience of this clinic speaks very strongly for the value of this simple diet. The freedom from gastro-intestinal disturbances supports its value. Use a simple diet ; if possible, leave the bowels alone ; and gastro-intestinal features will be diminished to a minimum.

With the question of food goes an equally important one, viz., the amount of water. The need of giving to patients large amounts of water is too often forgotten. Constant emphasis is laid on this, and a minimum of three litres of fluid *per diem* is the rule in this clinic. The endeavour is always made to give larger amounts. Many patients take six or seven litres a day. The delirious patients are pressed to take it every hour at least. Those who are rational have a supply constantly by the bedside, which they are encouraged to drink in addition to the regular feedings. To make sure that a typhoid patient is getting enough water requires constant effort on the part of the physician and nurse. The amount of urine passed is a very valuable guide. We consider that too much importance cannot be given to this. Probably typhoid-fever patients suffer more from lack of water than from any other thing. "More water" might well be the motto inscribed in all our typhoid wards. Do not let us forget that our patients will do perfectly well on water alone for some days.

Milk, whey, egg-albumen and large amounts of water comprise our usual dietary. Two rules regarding feeding are well to keep in mind, "Too little food rather than too much," and "More water." Those who use this simple method do not need to be told of its value ; to those who have not used it a thorough trial can be strongly advised.

II.—BATHS.

Hydrotherapy enters into practically every method of treatment of typhoid fever. We carry out the bath-treatment in nearly all the cases. This ought to be done when possible from the beginning. Brand insisted specially on this. Part of the benefit comes from its use early in the disease, even if the

symptoms be mild. We can never know how severe any case may become, and we believe that, if begun early, the bath-treatment lessens the likelihood of severe manifestations late in the attack, especially those due to profound toxæmia. To use the baths only in severe cases, or to wait until the patient is desperately ill, is fair neither to the method nor to the patient. Yet this is not infrequently done. Baths begun early and carried on systematically we believe to be the best form of treatment.

The reasons for which the bath-treatment is preferred may be discussed. It is evident that the effects on the various systems cannot be strictly limited. Through an improved state of the nervous system all the functions are improved, and this again may be largely due to increased excretion of toxines.

1. *The Effect on the Nervous System.*—This may be put first. The nervous symptoms are to some extent an index of the toxæmia. With the baths the severe symptoms usually improve rapidly ; delirium lessens, muscular tremors diminish, and the mental state clears. The old-time severe "typhoid state" is rarely seen in a clinic in which the bath-treatment is systematically used.

2. *Increased Excretion of Toxines.*—This occurs largely through the kidneys, and is one of the most important results of the baths. The effect of this is seen especially in the state of the nervous system.

3. *Reduction of Temperature.*—Let it be clearly understood that, despite a common opinion, this is *not* the main object of the baths. During the height of the attack the baths have but little influence on the fever ; later in the attack there may be drops of two, three, or four degrees.

4. *Effect on the Circulation.*—The heart-rate usually falls, and the pulse becomes smaller and harder. The soft, flabby pulse before the bath is in marked contrast with the firm pulse after it. There is usually a rise of blood-pressure, this on an average being about equal to 15 mm. Hg.

5. *Effect on the Respiratory System.*—This is marked. With each tub the patient takes at least three or four very full breaths, expanding the lungs thoroughly. This diminishes the chance of passive congestion, which we see very rarely. The initial bronchitis is usually greatly benefited by the baths.

6. *Effect on the Digestive System.*—We attribute the general absence of gastro-intestinal disturbances partly to the baths. The simple diet and other care may be as important.

7. *Effect on the Skin.*—The liability to bed-sores is much diminished. The frequent cleansing of the skin is a good prophylactic. Should boils occur, one bath-tub should be used for that patient alone.

8. *The Reduction of Mortality.*—This is the main purpose, and follows the improved conditions noted before. By the bath-treatment, systematically carried out, probably five to seven patients are saved in every hundred. Typhoid mortality throughout the world is much the same, and it is surprising to see how the death-rates agree in different countries, large numbers of cases being taken for analysis. There are no more convincing figures than those published by Hare¹ of Brisbane. The reduction in mortality is largely due to the diminished number of deaths from toxæmia ; those due to complications are probably not affected.

Objections.—There are many objections urged against the bath-treatment. That it means much work to all concerned is not denied ; but is this not a cheap price to pay for, perhaps, five lives saved in every hundred cases ? That they are cruel, I do not believe ; and this is said from observation of many hundred cases and from personal experience. Much depends on the way in which they are given, and every one superintending a clinic should take one himself. If many patients make complaint, it means that the baths are not properly given. A man should no more carry out the bath-treatment without instruction and experience than he should do operations. There will always be some complaint under any method, for an attack of typhoid fever is not a pleasant matter at the best ; but with care complaints can be reduced to a minimum. Our greatest difficulty is with foreigners (*e.g.* Poles), with whom one cannot communicate. The practice of beginning the baths only when the patient is very ill, or as a last resort, should be condemned. If used, they should be begun early and used systematically.

Method of Tubbing.—Our patients are tubbed every three hours when the temperature is 102·5° F. or over. Never are more than seven baths given in the twenty-four hours. The

tubs are given for fifteen or twenty minutes. The temperature of the water varies from 70° to 85° . There is no routine, and the temperature is chosen which does best for that patient. This is an important point, and one to which attention is drawn. The first tub is usually given at 85° , and succeeding ones 5° lower, until the most suitable point is reached. No ice is used in the tubs. This should be noted, as they are often referred to as "ice baths." Much depends on the first bath, and this should always be given in the day and with the physician present. It is usually well to leave the patient in the bath for ten or fifteen minutes at first. Should the patient be delirious, the first bath can be given at 70° . In these cases cold applications to the head are used.

While the patient is in the tub he should be rubbed constantly. This is a most important point in the treatment. During the bath the condition varies greatly. Some are comfortable, others shiver and complain of the cold. There may be marked cyanosis and blueness; these need never cause any alarm. The patients who shiver greatly during the bath and sometimes after being taken out, often seem to do very well. It certainly is not a bad sign. Patients are removed at once from the tub, if there be great distress, unusual cyanosis, or collapse, all of which are rare. Vomiting, haemorrhage, or a complaint of severe abdominal pain are also indications for immediate removal. The contra-indications are haemorrhage, severe abdominal pain, phlebitis, cholecystitis, any signs of peritonitis or perforation, and great prostration. Cases coming in late in the disease are not tubbed, if the condition be grave; although, if they can take the baths, even such cases are usually much improved. In the case of old or young patients other methods of hydrotherapy are probably better.

III.—GENERAL MANAGEMENT.

Rest, diet, and the baths comprise the treatment in many cases. The patients are given strychnine in doses of gr. $1/50$ every four hours, if the pulse becomes rapid or weak. But no drug is given unless there be some special indication.

The mouth requires constant care. The administration of large amounts of water and thorough cleansing after each feeding are important. We have a mouth-wash of carbolic

acid (1-20 solution), listerine, glycerine, aa ʒi., and boric acid (saturated solution) to ʒviii. This is used after each nourishment.

Bowels.—We prefer a state of constipation, which is the rule in a majority of our patients. If necessary, the bowels are moved every second day by a simple enema, preceded sometimes by a large injection of oil. No purgative is given by mouth during the attack. Diarrhoea is usually a signal for a reduction of the diet, milk being generally cut off. This may be enough. If not, bismuth in full doses or the lead-and-opium pill is given. In severe cases the enema of laudanum and starch is used. The use of opium tends to distension, and it is rarely given for any length of time. For tympanites we use turpentine externally, by the mouth, or by enema. The long rectal tube left in from half an hour to an hour may be of advantage.

Alcohol.—This is not given as a routine with the baths; in fact, most of our patients go through the attack without a drop. Emphasis is put on this, as in some quarters the giving of alcohol is considered a part of the bath-treatment. The opinion here is quite the contrary. If there be severe toxæmia or a failing circulation, it is given freely, but because the patient's condition demands it, not because he is getting baths. We have had thirty patients in the wards at once, and not one being given alcohol.

Drugs.—Many of the patients get no medicine at all. None of the so-called intestinal antiseptics are given. If the heart becomes rapid, the pulse weak, and the first sound indefinite, strychnine is given in doses of gr. $\frac{1}{80}$ to $\frac{1}{40}$ every four hours. This is used hypodermically in severe cases. At times, in the presence of marked circulatory symptoms, we have used digitalin hypodermically in doses of gr. $\frac{1}{80}$ every four hours, with excellent results. This usually is not given continuously for more than twenty-four hours. Special conditions may require medication. For the severe headache small doses of bromide and codeia, or of opium, are sometimes given. The ice-bag to the head is useful for this.

Severe Toxæmia.—This is rarely seen, if the patients have been put on the baths early in the attack; but later usually improves rapidly under the bath-treatment. One great difficulty is to get these patients to take sufficient liquid. In such

as will not take sufficient by the mouth, we use the saline infusions regularly two or three times *per diem*, giving altogether a litre to a litre and a half of fluid. These are very valuable. Should the patient refuse to swallow, the stomach-tube may be passed and food given this way. We can testify to the ease and value of this treatment. In some cases fluid can be given by the bowel.

Convalescence.—This may be the most troublesome part of the attack to treat. We are conservative in the matter of diet. There may be no danger in the early giving of solid food : there is certainly safety in the opposite course. Clear soups, broths, gruel, beef-tea are gradually added to the diet, when the temperature becomes normal. Junket, custard, jelly, and a soft egg are given during the first few days of normal temperature. Then soft toast is added about the end of the first week. From the seventh to the tenth day scraped beef or sweet-bread is given, and after this the diet is gradually increased. If we add a little every day, the patient is less likely to complain. Reference to hunger and diet should be avoided. The patient is usually propped up in bed about the tenth day, and allowed up in a wheel-chair three or four days later. If there be any grade of anaemia, the patients are given iron. Of course the whole management of this stage is influenced by the character of the attack.

IV.—COMPLICATIONS.

Hæmorrhage.—The best treatment of this is most difficult to decide. Absolute quiet—secured, if necessary, by morphia given hypodermically—is important. The diet is reduced to albumen alone, or all food may be discontinued. It may be advisable to discontinue stimulants for a time. A light ice-bag is applied to the abdomen. A difficult question is as to the advisability of giving opium by the mouth. How much we are going to lessen bleeding from the intestine by its use may be questioned, despite long custom. Certainly we run one danger, viz., that of failing to recognise perforation. One-fifth of our cases of perforation occurred along with hæmorrhage. In some instances in the last few years we thought that we could rule out perforation as coexisting with hæmorrhage, and opium was given ; but we were wrong, and all chance of saving the patient

was lost. Give opium to a patient with perforation and the diagnosis, if ever made, is too late to be of use. Then the use of opium favours distension. Do we gain anything in these cases by substituting distension for peristalsis, the stopping of which is principally the object of the administration of opium? The formation of a clot may perhaps be favoured.

Recently we have tried calcium chloride on theoretical grounds, usually in doses of gr. 15 every four hours. This also may be used as a possible prophylactic measure. The blood-coagulation time of the typhoid patients is taken on admission, and if it be longer than normal, calcium chloride is given in doses of gr. 15 three times a day. We are unable as yet to speak of the value of this as a prophylactic measure; only a considerable number of cases can settle the question of its value. Gelatine injections may be given, but they are apt to disturb the patient, and calcium chloride is probably as useful.

Should one use saline infusions after haemorrhage? If the patient be in collapse and exsanguine, they should undoubtedly be given; but in ordinary cases they are of questionable utility, and in some instances seem to determine another haemorrhage. As a routine they are not advised. We have largely given up their use.

The operative treatment of haemorrhage suggested in some quarters seems of doubtful utility. We have not advised it.

Cholecystitis.—In this "border-line" condition the question of treatment is a difficult one. Granted that cholecystitis be present, should the abdomen be opened and the gall-bladder drained? Some cases, probably the majority, will recover without interference, others will as certainly die. The milder cases usually clear up spontaneously. If the patient be conscious, so that a correct idea may be had as to pain and tenderness, and if he is in a place where constant watching is possible, and where immediate operation may be done if perforation occurs, one can wait with some degree of comfort. But there is always the risk of waiting too long, and after one has lost a case from so doing there is more inclination to advise operation. If the symptoms be acute and the signs pronounced, especially if they be progressive, operation is probably the safer course. Tapping the distended gall-bladder through

the abdominal wall ought not to be done. The operation can be done very readily under cocaine, and is most satisfactory.* If perforation have occurred or be strongly suspected, operation should be done at once. There can be no question as to this. It is not safe to consider that there is no danger of perforation so long as the gall-bladder is not palpable. A much enlarged gall-bladder may not be felt, or perforation may occur in a non-distended condition. In any case with marked symptoms we consider operation the safer course. It means little added risk, whereas waiting may mean the same, or it may result in the loss of the patient. The exact procedure must depend on the condition found. As a rule, drainage is the safer course. It may be advisable to pack gauze about the gall-bladder and open a few hours later.

Perforation.—Here diagnosis is difficult, while treatment—if the condition be recognised before the patient be moribund—consists in immediate operation. But we ought to consider it a part of our treatment to be prepared to make the diagnosis as early as possible. The staff of nurses should have instructions to report suspicious symptoms at once, and the patient should be seen immediately by the physician. Careful notes and records should be kept throughout. This has been emphasised especially by Dr. Osler.² Even in apparently hopeless cases there may be a chance. Three cases were admitted to Dr. Osler's wards in the past year with general peritonitis following perforation of a typhoid ulcer: all were operated on, and one recovered. In suspicious cases an exploration under cocaine is perfectly justifiable.

At operation, if perforation be found, the condition present must determine the procedure. A clean-cut perforation may be closed by a purse-string suture of fine silk, and reinforced by "mattress" sutures. Suspicious ulcers may be turned in by the same method. Such a suture has always remained intact in our cases. When the perforation is closed, the omentum should be brought down over the point of suture. Drainage should always be used, for which gauze is employed. In cases with

* Laparotomy in typhoid fever should almost always be done under cocaine. When it is used by a surgeon accustomed to it, there can be no more satisfactory procedure. One can advise operation with the certainty that there will be but little injurious effect to the patient. A previous dose of morphia hypodermically is an advantage.

much distension and general peritonitis, a method recently suggested by Escher³ may be used. This is to bring the perforation into the wound and make an artificial anus. In our last successful case this was done by Dr. Follis, and proved very satisfactory. If the bowel be friable and sutures do not hold—as happens, fortunately, rarely—excision of a portion of the bowel and bringing the ends into the wound may be tried. Such cases, however, are almost hopeless. The extent of the peritonitis is a most important factor. Irrigation is not used, but the exudate is wiped away by gauze pads moistened with salt-solution. It is important to use gauze drains to the badly-involved areas.

In all cases the element of haste in operation is important. Close the source of infection, wipe away as much exudate as possible, put in drains, and get the patient off the table as quickly as can be done. So far as the operation goes, there is no difference in procedure from that in a case of perforative appendicitis with general peritonitis; nor does the after-treatment differ in any way. The possibility of a second perforation, or of intestinal obstruction afterwards, has to be remembered; and if necessity arises, even a desperate condition should not prevent interference. Recovery after three operations is an encouraging fact to remember.

The most important point in the successful treatment of perforation is early operation. This means early diagnosis. It rests upon all of us who are handling patients with typhoid fever to be as familiar as possible with the symptoms, so that we may appreciate the condition as soon as possible. The surgeon should be called in early, and no hesitation felt in advising exploration if the symptoms demand it. No words can give exact rules as to when this is the case. Thorough preparation by early observation, careful notes, and knowledge of the conditions, all help to prevent needless exploration. We must bear in mind that the symptoms of perforation and of general peritonitis are not the same. Our endeavour ought to be to recognise the former before the onset of the latter.

There may be peritonitis without actual perforation of the intestine or gall-bladder. The symptoms may not differ from those of perforation. Exploration is indicated. The important

point is not to feel called upon to diagnose the condition exactly, but to be able to recognise an acute abdominal condition which demands exploration.

Urinary Conditions.—The most important is the occurrence of typhoid bacilli in the urine. The unrecognised frequency of this in the past has undoubtedly had much to do with the spread of typhoid fever. The urine should be frequently examined for the presence of the bacilli, and if they be present, the patient should not be discharged until the urine is free of them beyond all doubt. Unless the house-physicians are conscientious and make frequent and thorough urinary examinations, many cases of typhoid bacilluria will be overlooked. In some clinics all the typhoid-fever patients are given urotropin two days in the week as a prophylactic measure. Urotropin in doses of ten to fifteen grains ought to be given by mouth when the bacilli are present, and its use should be kept up after the urine is clear. In cases of cystitis bladder-irrigations of 1-100,000 to 1-50,000 solution of bichloride of mercury are most useful.

The disinfection of the urine cannot be too carefully watched. The best solution to use is 1-1,000 bichloride of mercury. An amount equal at least to one-tenth of the quantity of urine will kill the typhoid-bacilli in fifteen minutes.

Tender Toes.—This is often a most troublesome condition. We have found that painting the toes with equal parts of tincture of iodine and alcohol once or twice a day nearly always gives relief. If not, the application of oil of wintergreen may be tried.

SUMMARY.

To sum up:—we strive for simplicity in the treatment of typhoid fever. A simple diet with abundance of water, the bath-treatment used systematically, and drugs given only when special indications arise, are the important points. Special attention should be given to the early recognition of abdominal complications and prompt operative treatment adopted at the earliest moment when necessary.

¹ Hare: THE PRACTITIONER, 1897, n.s., Vol. VI., p. 254.

² Osler: Philadelphia Med. Jour., 1901, VII., p. 116; Lancet, 1901, I., p. 386.

³ Escher: Mittb. a. d. Grenzgebieten d. Med. u. Chir., 1903, Bd. X., Ht. I., p. 104.

"PARATYPHOID" FEVER.

BY R. TANNER HEWLETT, M.D., M.R.C.P., D.P.H.,

*Physician to the Seamen's Hospital, Greenwich; Professor of General Pathology
and Bacteriology in King's College, London; Lecturer in Bacteriology,
London School of Tropical Medicine.*

MANY forms or states, whether of life, of matter, or of energy, in their broad features may appear to be identical, but these supposed identities when subjected to the mill of critical examination may show minute differences, the sum of which is sufficient to differentiate them. This is seen in systematic zoölogy and botany in the making of new species, in chemistry in the isolation of new and rare elements, in physics in the separation of the various rays and emanations.

The same is taking place in medical science. It is only comparatively recently that the various forms of anæmia, of septic infection, of paralysis, and of muscular atrophy have been distinguished and further differentiation is in progress yearly. It would not be a matter for surprise, therefore, if what we term typhoid or enteric fever, a disease which presents such remarkable diversity in its clinical course, should prove to be a group of closely allied conditions dependent upon different ætiological agents. This process of differentiation is in progress ; it was commenced when Sir William Jenner separated typhoid from typhus fever, it was continued by the recognition of Malta or undulant fever as a distinct disease. In this last connection it is of interest to note that certain continued fevers in India regarded as typhoid or "typho-malarial" have been shown to be in reality Malta fever. Lastly, we have the conditions known as "paratyphoid" or "paracolon" fever or infection, which may simulate typhoid fever in almost every feature but which are not caused by the *Bacillus typhosus*. It is not improbable that further differentiation will ensue in the future. Paratyphoid fever may be defined as a disease resembling typhoid fever in its clinical course and main characters which is, however, caused not by the typhoid bacillus but by a different, though closely related,

microorganism. The name is perhaps not the best that might have been chosen, but seems to be now established in medical literature. Since the essential distinction between paratyphoid fever and typhoid fever lies in the difference of the infecting agent and not in the symptomatology, as will be detailed later, it will be convenient first to discuss the bacteriology of the condition.

BACTERIOLOGY OF PARATYPHOID FEVER AND INFECTION.

Paratyphoid fever is due to the paratyphoid bacillus. The paratyphoid bacilli (for there are different races) are organisms intermediate in their characters between the true typhoid bacillus and the colon-bacillus, and are placed in the so-called "Gärtner" group. To this belong the bacilli of epidemic meat-poisoning (*B. enteritidis*), the pneumonic *B. psittacosis*, the hog-cholera bacillus, and the bacillus of mouse-plague (*B. typhi-murium*). The name "paracolon" bacillus was given by Gilbert in 1895 to such races of bacilli intermediate in type between the typhoid bacillus and the colon-bacillus, and among other authors this designation was applied by Widal and Nobécourt to a bacillus isolated by them from an abscess in the neighbourhood of the thyroid. The name "paratyphoid" bacillus appears first to have been used by Archard and Bensaude in 1896, and was reintroduced by Schottmuller in 1901, and would seem to be the preferable designation for those microorganisms that produce typhoidal symptoms. The paratyphoid bacilli, as a rule, resemble the typhoid bacillus in morphology, that is to say, they are multi-flagellate (6-8-12) actively motile bacilli, which do not stain by Gram's method, and do not form spores. Their growths on agar and gelatine also resemble those of the typhoid bacillus, but on other media present striking differences. The paratyphoid bacilli always ferment d-glucose (dextrose) with the production of both acid and gas ; the typhoid bacillus produces acid only ; neither attacks lactose, which is fermented by the colon-group. Cultivated in litmus-milk, the typhoid bacillus develops a permanent acidity with no other change ; the paratyphoid bacilli usually produce a transient acidity followed by alkalinity, but no other change ; the colon-bacillus produces permanent [acidity with curdling.

As regards the agglutination (Widal) reaction, the blood of the paratyphoid-fever patient either does not agglutinate the typhoid bacillus (*i.e.* "Widal reaction is negative") or agglutinates it only in low dilution, *e.g.*, 1 in 30 or 40, while it agglutinates the paratyphoid bacilli in far higher dilution, *e.g.*, 1 in 100 or 200 or even higher. (In Cushing's case, the patient's serum agglutinated the paratyphoid bacillus isolated from it up to 1 in 8,000.)

The principal differences between the members of I., the typhoid group, II., intermediate or Grtner group, and III., the colon-group, are shown in the table on page 177.

As has been indicated before, there seem to be several varieties of paratyphoid bacilli, differing from one another in their source, rate of fermentation of d-glucose, action on milk, action on neutral red, and agglutination-reaction. These differences are usually minute and to be detected only on careful study, and are not sufficient to make distinct species or even varieties. It is customary among bacteriologists to distinguish these races by their source; thus we have the bacillus Gwyn, bacillus O, bacillus Hatton, bacillus Kurth, bacillus Kay, bacillus L. (Hume), &c. There seem to be, however, two broad groups of the paratyphoid bacilli, which have been termed α and β by Buxton. Group α produces less gas in d-glucose media than group β ; with group α milk remains permanently acid; with group β it becomes alkaline after a transient acidity; and though group α changes neutral red to yellow, the red colour returns after three weeks or so, while with group β the yellow colour is permanent. That is to say, in their reactions the paratyphoid bacillus α is more closely allied to the typhoid bacillus than is the paratyphoid bacillus β .

The Intermediate or Grtner group may therefore be divided as follows:—

1. *Enteritidis group*.—Produce acute gastro-intestinal disturbance in man. The cause of epidemic meat-poisoning, *e.g.*, the *B. enteritidis* of Grtner.

2. *Pneumonic group*.—Produce pneumonic symptoms in man. The cause of some outbreaks of epidemic pneumonia, *e.g.*, *B. psittacosis*.

—	Morphology.	Motility.	D-glucose.	Lactose.	Litmus-Milk.	Indol-production.	Neutral Red.
Typhoid Group	Bacilli of varying length. "Thread" forms present.	Actively motile. 8-12 flagella.	Acid formed; no gas.	No action	Permanent acidity; no other change.	No indol	No change.
Intermediate or Gätner Group.	Do. - - -	Do. - -	- Acid and gas formed.	No action	First acid, then alkaline. No other change.	No indol	Becomes yellow.
Colon Group	- Bacilli tending to be shorter than foregoing.	Feebly motile. 3-4 flagella.	Do. -	- Acid and gas formed.	Permanent acidity, with curdling.	Indol formed	Do.

3. *Paratyphoid group.*—Produce a disease resembling typhoid fever in man. Subdivisions α and β .

4. *Group non-pathogenic to man, e.g., B. cholerae suum and B. typhi murium.*

CLINICAL COURSE OF PARATYPHOID FEVER.

Some hundred or so cases have now been described. Pratt, in a valuable paper published at the commencement of 1903, abstracts no less than 84 cases. In the majority of the cases the paratyphoid bacillus β was the aetiological organism. It may be of interest to give briefly the clinical details of three of the cases of paratyphoid fever that closely simulated typhoid fever.

Gwyn's case is perhaps one of the most striking that has been recorded, since it had all the clinical features of typhoid fever :—

L. S., admitted October 11, 1897, had been ill since September 17, with headache, fever and weakness, and later with vomiting, diarrhoea, and pain in the abdomen. On October 14 noisy delirium set in ; on October 16 the patient had three haemorrhages from the bowel ; he slowly rallied and went out five weeks later. Rose-spots were present ; the spleen was palpable ; the urine showed the diazo-reaction ; there was no diarrhoea (in hospital). The agglutination-reaction with the typhoid bacillus was always negative even in such low dilutions as 1 in 1 and 1 in 5 (it was tested several times). Blood-cultures on October 12 gave a small, actively-motile bacillus which subsequent tests proved to be an α -paratyphoid. This bacillus was agglutinated by the patient's blood in dilutions of 1 in 150 to 200. The bacillus was not agglutinated at all by typhoid sera of high agglutinative power.

But for the fact that the agglutination-reaction with the typhoid bacillus was negative, this case would undoubtedly have passed as a genuine attack of typhoid fever.

The following case is recorded by Pratt (Case III.):—

D. B., male, $\text{æt. } 38$. On Oct. 28, 1902, he was seized with sharp pain over the umbilicus and region of the appendix. On Oct. 30 the temperature was 102° and pulse 80 ; there was slight abdominal tenderness ; the spleen was enlarged to percussion, but was not palpable. No rose-spots developed. The

temperature gradually fell, but there was some fever for over two weeks. There was slight tendency to constipation. The pulse was not accelerated. The agglutination (Widal) test was negative; feeble clumping in a 1-in-10 dilution in one hour; no clumping in 1-in-20 dilution. There was no leucocytosis. During the third week saphenous phlebitis of the left leg developed. On November 19th 8 c.c. of blood were withdrawn from the median basilic vein and sown into broth. A culture of a β -paratyphoid bacillus was obtained. The blood of the patient agglutinated this bacillus in dilutions of 1 in 500. Several strains of the α -paratyphoid bacillus were not agglutinated in dilutions of 1 in 10.

This case illustrates the necessity for testing for the agglutination-reaction with both the α and β strains of the paratyphoid bacillus.

The third case was under the care of Dr. Caton, and is reported by Hume :—

T. R., male, æt. 29, a bricklayer, was admitted into the Royal Infirmary, Liverpool, on September 24, 1901. His illness had commenced on September 15 with headache and pain in the back and legs. On September 19 he had severe attacks of vomiting and diarrhoea. On admission the temperature was 101° 4' F.; the spleen was enlarged and palpable, and numerous rose-spots were present on the chest and abdomen. Between October 7 and November 18 the temperature ranged between 101° and 102°; there was considerable diarrhoea, with blood in the stools on several occasions. On October 29 the haemorrhage was severe. Convalescence commenced on December 9, and the patient was discharged on the 23rd of that month. During December there was a good deal of cystitis. The temperature-curve simulated that of typhoid very closely, and there was a well-marked relapse. The agglutination-reaction was not tried during the acute stage of the disease, but on November 28 was not obtained with the *Bacillus typhosus* in dilutions of 1 in 10. A paratyphoid bacillus was isolated from the stools and from the urine, probably of the α -variety, since milk-cultures remained permanently acid. The patient's blood agglutinated this bacillus in dilutions of 1 in 200.

Cases have been reported of double infection with the

typhoid and paratyphoid bacilli. A general infection with the paratyphoid bacillus in scarlatina has also been recorded by Jochmann.

OCCURRENCE OF THE DISEASE.

The disease has a wide geographical distribution, and cases have been reported in England, France, Germany, Holland, in various parts of the United States, in the Philippine Islands, and in Cuba. It may occur in epidemics; Hünermann has described one of thirty-eight cases. It may be spread by drinking-water, as in cases reported by Von Sion and Von Negel and by De Feyser and Kayser. The disease principally affects young adults, and is most prevalent in the autumn.

SYMPTOMATOLOGY.

Evidently paratyphoid fever may simulate typhoid fever in every particular—mode of invasion, temperature-curve, duration, relapses, eruption, enlarged spleen, diazo-reaction, absence of leucocytosis, diarrhoea and haemorrhage from the bowel. Just as in typhoid fever, various complications occur, e.g., phlebitis and thrombosis, bronchitis and pneumonia, cholecystitis and cystitis, and various suppurative conditions. Cushing's case is an interesting example of the last-named. The patient was admitted into hospital suffering from a discharging sinus in the region of the sternum. Nine months before admission he had suffered from a prolonged febrile attack, extending over ten weeks, and accompanied by a relapse; it was regarded as a typical attack of typhoid fever. Subsequently a nodule appeared near the breast-bone; this burst and discharged pus, leaving the sinus in question. From the pus Cushing isolated a paratyphoid bacillus, which was agglutinated by the blood of the patient in high dilution. Cystitis was present in Hume's case (*see above*), cholelithiasis in a case of Pratt's.

MORTALITY AND PATHOLOGY.

Paratyphoid fever appears to be generally less severe than typhoid fever, only four or five fatal cases having been recorded.

The fatal cases seem to have been all cases of infection with the β -bacillus. In these fatal cases no ulcers of the intestine were found, though the occurrence of haemorrhage would suggest that lesions of the intestinal mucous membrane do occur. In a fatal case, recorded by Longcope, not only were ulcers absent, but, microscopically, there were no lesions of the intestine, and the endothelial proliferation in the lymphoid tissue of the intestine, in the mesenteric glands, and in the spleen, described by Mallory, was not found. In a case recorded by Luksch neither the Peyer's patches nor solitary glands were enlarged or ulcerated. It is not unlikely that some at least of the recorded cases described as typhoid fever without intestinal lesions were really cases of paratyphoid infection, while others may have been really cases of typhoid with slight intestinal lesions; since, as Opie has pointed out, many of such cases did present swelling of the lymphoid follicles or even small ulcers, while the bacteriological records are very incomplete.

DIAGNOSIS.

The diagnosis of paratyphoid fever will probably only be possible under two conditions:—(1) when in a case of supposed typhoid fever, the agglutination-reaction is absent, or obtained only in low dilution, and further investigation shows the presence of a paratyphoid bacillus which is markedly agglutinated by the patient's blood; and (2) when blood-cultures are made from all suspected typhoid cases and are critically examined, as is now being done in some clinics. Should the agglutination-reaction with the typhoid bacillus be absent or feeble in a case clinically typhoid, especially if the disease seems to be running a mild course, the suspicion of paratyphoid fever should always be entertained; for (a) paratyphoid fever is usually not severe, and (b) the agglutination-reaction in typhoid fever is on the whole more marked in the mild than in the severe cases.

If opportunity permit, the agglutination-reaction might be tried with different races of paratyphoid bacilli.

Doubtless many of the cases of supposed typhoid which are stated not to have given the agglutination-reaction were in reality cases of paratyphoid fever.

REFERENCES.

- Achard and Bensaude : *Bull. et Mém. de la Soc. méd. des Hôpitaux de Paris*, XIII., 1896, p. 820.
Buxton : *Journ. of Med. Research*, VIII., 1902, p. 201.
Cushing : *Johns Hopkins Hosp. Bull.*, XI., 1900, p. 156.
De Feyfer and Keyser : *Münch. med. Woch.*, 1902, XLIX., p. 1692.
Gilbert : *La Semaine Médicale*, 1895, p. 1.
Gwyn : *Johns Hopkins Hosp. Bull.*, IX., 1898, p. 54.
Hume : *Thompson-Yates Laboratories Rep.*, IV., Pt. II., 1902, p. 385.
Hünermann : *Zeitschr. f. Hygiene*, XL., 1902, p. 522.
Jochmann : *Contr. f. Bakt.*, XXXIII., "Referate," 1903, p. 8.
Longcope : *Amer. Journ. Med. Sci.*, CXXIV., 1902, p. 209.
Lukach : *Contr. f. Bakt.*, XXXIV., "Originale," 1903, p. 113.
Mallory : *Journ. Exper. Med.*, III., 1898, p. 611.
Opie : *Johns Hopkins Hosp. Bull.*, XII., 1901, p. 198.
Pratt : *Boston Med. and Surg. Journ.*, CXLVIII., 1903, p. 137.
Schottmuller : *Zeitschr. f. Hygiene*, XXXVI., 1901, p. 368.
Von Sion and Von Negel : *Contr. f. Bakt.*, XXXII., "Originale," 1902, pp. 482,
581.
Widal and Nobécourt : *La Semaine Médicale*, 1897, p. 285.



Notes by the Way.

Enteric or Typhoid Fever. IT is not so very long ago that enteric fever was discovered, if we may so call it. In

ancient and mediæval times all fevers were grouped together, and the task of disentangling them from one another was left for the physicians of comparatively modern days. In 1849 Jenner established the difference between typhus and typhoid or enteric fever, and to this day the Germans call them respectively *typhus exanthematicus* and *typhus abdominalis*. The two names typhoid and enteric fever still exist side by side in this country, and it is not altogether easy to decide which is the preferable term. Typhoid has perhaps the merit of antiquity, as it was originally coined by Louis (1829) for the fever which was like typhus, but not identical with it. In those days typhus, which has now been practically banished from this country by sanitary measures, was a well-known and very fatal disease, which decimated the inmates of jails and camps. To say that enteric fever is like typhus, as a means of description, is now indeed to describe *ignotum* (or rather *bene notum*) *per ignotius*. The term enteric fever has lately come into much more general use owing to its adoption by the War authorities during the South African campaign. It has the merit of calling attention to the most prominent lesion of the malady, the intestinal ulcers. If, as some writers wish, acute pneumonia should be called "pneumonic fever," enteric fever is a good name on the same lines for a disease which has its local habitation chiefly in the intestine. On the other hand, there is now a tendency to consider that enteric fever is a general septicaëmia, the organisms occurring in the blood-stream in many instances ; and those who uphold this view will perhaps consider that a name which lays stress on its local manifestations alone is a bad one. We have not attempted to preserve any uniformity of nomenclature in our present number.

*

*

*

*

*

The Causal Organism. THE *Bacillus typhosus*, discovered by Eberth and often called after him, is now well established as the cause of enteric fever. It is in many ways an interesting organism. It grows freely on

laboratory media, and is readily stained. Its numerous flagella, when brought into view by appropriate methods, cause it to present a striking appearance. Further, its somewhat close resemblance to the common inhabitant of the intestine, the *Bacillus coli communis*, raises questions as to the relations between these bacteria ; and when compared with, for instance, the group of acid-resisting organisms resembling the tubercle-bacillus, suggests the existence of families of microorganisms, closely related, or of genera embracing several species. Little seems to be known at present with any certainty as to the classification of bacteria. The existence of these families may lead to a system of arrangement for provisional grouping.

* * * * *

Methods of Infection.

PERHAPS the most important of all the questions connected with the enteric fever is the mode of its conveyance from one individual to another. One of the points most early established with regard to it was the frequency of carriage of infection by water. Probably this is in reality the most important means of spread of the disease, and in our present number Dr. Canney lays stress on this mode of conveyance, and bases on it important conclusions as to the methods to be adopted for preventing and combating enteric fever. But it cannot be maintained that water is the only source of contagion. The bacilli leave the body of the enteric-fever patient chiefly by means of the excreta—the faeces and the urine. The contamination of water-supplies by these infective agents is often the cause of an outbreak of the disease, but other agencies may carry the organisms to healthy individuals. In dry and dusty climates, the wind carries the bacilli about in the dust, and infection may perhaps occur by inhalation of the organisms by the air-passages, or by contamination of food. Flies too may settle on infective material, and then convey the germs to milk and other provisions. Further, there is a very real danger of direct infection being carried from a patient to those concerned in tending him. Cases of nurses catching enteric fever from their patients are unfortunately not uncommon, and no large hospital can expect to escape such accidents entirely. Other patients also, lying near to sufferers from enterica, at

times contract the disease. If such instances occur even in hospitals, where all possible precautions are taken to prevent any conveyance of infection, how much more will they take place in the case of patients nursed at home, often under circumstances rendering precautionary measures difficult ? The accumulated evidence as to the importance of personal infection in London epidemics is well set forth by Dr. Newman. Owing to this risk, it is most important that cases of this disease should be isolated and treated in special hospitals, except in the case of well-to-do persons who can afford trained nurses and who have homes suitable for proper treatment of an infectious disease.

Another method of infection, which has come into prominence in recent years, viz., by oysters and other shellfish which have been exposed to contamination with sewage, is also dealt with in Dr. Newman's article. Several examples of such accidents outside the Metropolis have recently been before the public ; yet it cannot be doubted that, owing to the resulting fear of enteric fever, oysters have fallen to some extent into undeserved disrepute. In the best-managed beds every care is taken to prevent the possibility of contamination, and oysters coming from such sources are free from danger. The difficulty lies in ascertaining beyond all doubt the actual locality from which the molluscs have come. Until this is possible, all alike will remain under suspicion. It is to be hoped, however, that local authorities will realise their duties in the matter of sewage-disposal, and that before long the possibility of oysters becoming contaminated with sewage will only be remembered as an extraordinary instance of the dirty habits prevalent in a past generation.

Another form of food which is liable to become contaminated with enteric bacilli is milk. The organisms give no outward and visible sign of their presence in this fluid, since they do not produce coagulation, as do their allies, the colon-bacilli. Hence no suspicion is aroused. Typhoid bacilli are capable of living for some time, and perhaps of multiplying, in milk, so that the danger existing in cases of contamination of this fluid is considerable.



Military Preventive Measures. THE question of the mode of conveyance of infection in enteric fever is closely bound up with the all-important problem of prophylaxis in the army. Enteric fever is at all times one of the great scourges of troops in the field, and the recent experiences in South Africa have brought the matter forcibly before the notice of our military authorities. Dr. Canney is a vigorous upholder of the view that, if only the water-supply be kept free from contamination, no great spread of an epidemic can occur ; and he has devised means by which a sufficient supply of sterilised water can be prepared for troops on active service. By such measures it might be possible to prevent an outbreak of the disease among troops previously free from infection, if it is actually as feasible as is assumed to prevent men from drinking from unauthorised sources. But is this the case ? We speak as mere civilians, ignorant of the conditions of warfare ; but we have doubts as to the possibility of preventing troops suffering from the severe thirst of campaigning in a hot climate from drinking from streams or rivers by which they may pass ; and if they do so, a widespread epidemic may well be started, for it has already been shown that there are other ways of infection from an existing case beside contamination of water-supplies. Nevertheless, as to the immense importance of securing pure water for drinking- and washing-purposes no one can affect to be in doubt.

The other point of the most urgent importance is to secure the effectual disinfection of all excreta. We confess to having heard stories of great authorities visiting the hospitals during the recent war, and enquiring of the medical officers why they did not utilise the excreta of the patients for growing vegetables. We do not vouch for the truth of the rumour, and we hope that all military and other sanitarians are now alive to the danger of such a proceeding. The best mode of disinfection of excreta is probably to burn them with a due admixture of sawdust. Failing this, chemical disinfectants must be employed, the infected material being well mixed with the antiseptic and the whole left to stand for a sufficient time before it is buried in the trench provided for the purpose. It is most important that flies should be as far as possible prevented from obtaining access to the excreta, and the latter must not be suffered to become

dry and thus to be carried about as dust. We fear that, in spite of all precautions, enteric fever is likely to remain as deadly a foe as any civilised or savage enemy that our soldiers are likely to be called upon to face.

* * * * *

Serum-Test for Enteric Fever.

THE so-called Widal test for enteric fever is now well known and constantly practised. It is founded on the fact that the serum of patients suffering from enteric fever possesses the power of causing the bacilli of the disease to adhere to one another in masses, instead of moving freely about in the culture-fluid as they normally do. It was at first hoped that this reaction constituted an infallible test for the existence of enteric fever. This view is no longer tenable. The serum of persons who have never suffered from the disease may at times respond to the test, while occasionally patients suffering from true enterica fail to exhibit this phenomenon. Further, the original method has had to be modified, and now the serum is always diluted considerably before it is used for the investigation. Indeed, the slight dilution ($1 : 10$) which was generally recommended only a short time ago is now superseded by higher dilutions, to $1 : 20$ or $1 : 50$. With these precautions the test, though not infallible, is a very great help in the diagnosis of this difficult disease. The margin of error with the high dilutions is probably not more than 5 per cent. It must, however, be borne in mind that the reaction is not always present in the early stages (first and second weeks) of the disease. Hence a negative result at this period is of little importance. Some concurrent conditions, also, such as jaundice, may prevent the test from being employed, as agglutination may occur in patients suffering from this condition apart from the existence of enteric fever. On the whole, the reaction has not much prognostic value, as far at least as the rapidity and completeness of the clumping-process are concerned; but if, in a fairly certain case of severe enteric, the patient fails to exhibit the reaction, there seems to be a probability that the attack will prove fatal. The absence of agglutinative power in the serum in such patients seems to be parallel with a lack of defensive capacity, agglutinins and bactericidal substances being alike wanting.

One apparent source of error in applying the Widal test lies in the existence of the condition known as "paratyphoid fever," of which Professor Hewlett contributes an interesting account to our present number. Infection with the paratyphoid bacillus—an organism, or group of organisms, closely allied to both the typhoid bacillus and the colon-bacillus—produces symptoms closely resembling those of enteric fever; but the characteristic intestinal lesions appear to be usually absent. Perhaps these bacilli do not form a "leucotoxic" substance like that by which the *B. typhosus* destroys the lymphoid tissue of Peyer's patches. The serum of patients suffering from paratyphoid fever does not exhibit the Widal reaction with *B. typhosus*, but may agglutinate the paratyphoid organism.

* * * * *

Serum-Treatment of Enteric Fever. MANY attempts have been made to prepare a serum which shall be curative of this disease; at present, however, we have to confess that practical success has not been achieved. On the one hand, it has not been possible to procure the poisons of the bacilli in a concentrated condition in culture-media, as has been done in the cases of diphtheria and tetanus, so that no antitoxic serum of similar efficacy can be prepared. Professor Chantemesse, of Paris, has indeed claimed to have prepared an antitoxic serum, and some good results have been recorded from its employment; but as yet sufficient evidence has not been forthcoming to engender any great amount of confidence in this remedy. It is sincerely to be hoped that it may prove to be of value. On the other hand, the serum obtainable in the market as "antityphoid" is generally of an antibacterial, not an antitoxic, kind, tending to destroy the organisms rather than to counteract their toxines. This variety of serum has not proved successful as applied to man, though experimental results in animals have been encouraging. Several causes, alone or combined, may underlie this failure. It is now known that the destruction of bacteria by an immune serum is effected by means of two separate substances—an alexine or complement which is always present in the blood even of normal individuals, and a copula or immune body which is produced by the cells of the tissues in response to infection. Curative serums are mostly

prepared from horses, and the effect of such a serum lies in supplying a quantity of copula sufficient to enable the alexine of the patient to attack the bacilli. But on the one hand it may be that, at the time when the serum is used, the supply of alexine present in the blood may be seriously diminished, or on the other, that the copula which is capable of uniting horse-alexine to *B. typhosus* may not equally facilitate attack by human alexine, and that failure may thus result. Again, it is possible that the serum may not have much opportunity of reaching the bacilli, which may be situated chiefly in the intestinal lesions. However it may be, there is no doubt of the disappointing results so far obtained with anti-typhoid serum.

* * * *

**Anti-typhoid
Vaccination.**

MORE is to be hoped for in the way of prophylaxis by means of "antityphoid vaccination," as carried out by Professor Wright. A considerable amount of evidence is now available as to the efficacy of this procedure. Most of the inoculations have been carried out in the British army, during the late South African war and in India. Taking all the published figures on the subject, we are justified in concluding that a distinct amount of protection is afforded by inoculation. Not only are fewer individuals attacked among those inoculated than among those not so treated, but the attacks in such vaccinated persons tend to be less severe. The chief drawback to the procedure at present seems to be the severe reaction which it causes. Great tenderness and actual pain ensue at the point of vaccination, and the constitutional symptoms are most distressing, consisting in rise of temperature, shivering, sickness or nausea, pains in the limbs, and a sense of great depression and illness. Such results may well act as a deterrent, in the absence of any immediate danger of infection. Yet we think that there is sufficient evidence of the value of inoculation to make it advisable for those who are going into parts of the world where enteric fever is prevalent, or who are to take part in active military service, to undergo the immediate disadvantages for the sake of future immunity. It is to be hoped that in course of time some modification of the present mode of vaccination

may be discovered, which will do away with some of the severity of the first reäction.

* * * * *

General Treatment of Enteric Fever. OUR readers will find on other pages several articles dealing with the treatment of the disease. On the whole, in this country, treatment is mostly of the "expectant" kind, consisting chiefly of complete rest with slop-diet and careful nursing. Several special methods of treatment have been suggested. That which has attracted most attention and perhaps gained most favour is the bath. Very good results have been obtained by this method at many times, notably at the Johns Hopkins Hospital, to which, under Professor Osler's leadership, the medical world has learned to look for guidance in almost all departments of research. We have to thank Dr. Macrae for kindly contributing to our present issue an account of the treatment of enteric fever as there carried out. Another plan of procedure is the "intestinal antiseptic" method, consisting in the employment of such drugs as carbolic acid, naphthalene, β -naphthol, salicylate of bismuth, turpentine, &c., in order to destroy the bacilli in the intestine. Theoretically these remedies should be of value, and practically they certainly do no harm if wisely administered; but the total results obtained by their means have been disappointing. Of them all there is perhaps most to be said for turpentine, which is not only antiseptic but also astringent and antiflatulent. Given in capsules of 10 minims, three or more times a day, it certainly seems to have a beneficial effect in some cases, and is well borne by most patients. The use of urotropine to destroy the bacilli which are excreted in the urine is certainly to be recommended from the point of view of public health.

* * * * *

The Oxford Professorship of Medicine. THE resignation of Professor Burdon Sanderson leaves vacant one of the most distinguished of all medical appointments. The task of filling up the vacancy will not be altogether an easy one. An ideal candidate should not only be eminent in the medical world—one who has himself practised the art of healing and is experienced as a teacher, so as to be able to

take a wide view of the needs of students, and to resist excessive demands from the partisans of the various sciences which, though they form the groundwork of the medical art, yet are not integral parts of the knowledge needed for the treatment of disease—but he should be a man of energy, capable of championing the claims of his school, and of representing it worthily in the eyes of the world, at home and abroad. Much will depend upon the new Professor, who will enter on his duties at a time when the Oxford school is increasing rapidly both in numbers and in efficiency. Its official head can do much to mould its destinies. Oxford medical graduates should be able, if they wish, to make their voices heard in the selection of a Professor. We hope that in some way or other they will do so, and that in the end the right man may be put in the right place. Rumours reach us of a scheme which practically amounts to using the endowments of the Regius Professorship for the furtherance of pure pathology, without regard to the claims of clinical knowledge. It is devoutly to be hoped that no plan of the kind will commend itself to the Prime Minister, who has the appointment in his hands. May it not have been to some extent due to the fact that the retiring Professor was a devotee of pure science rather than a practical physician, that led to the passage of very undesirable strictures upon the Oxford medical examinations by the General Medical Council? The possibility of any repetition of an occurrence so discreditable to the University should be carefully guarded against in the future.

THE PRACTITIONER.

FEBRUARY, 1904.

ANTI-TYPHOID INOCULATION.

BY A. E. WRIGHT, M.D.,

Late Professor of Pathology, Army Medical School, Netley; Pathologist to St Mary's Hospital, Paddington, W.

PART II.

It has appeared in Part I. of this paper that every condition of immunity is based upon the elaboration of antitropic substances in the organism. Here we pass on to the practical question as to how a condition of insusceptibility to typhoid infection may be achieved.

Taking it as a working assumption that for this purpose we can compass our object only by inducing an elaboration of typhotropic substances in the organism, and by the inoculation of a vaccine prepared from a typhoid culture, our subject-matter distributes itself naturally under three headings. We have to ask ourselves :—

(a) What kind of services we desire the typhotropic substances, which are to be called into being, to undertake in the organism ;

(b) What form of culture, or what culture-derivative—what vaccine, in short—will induce the organism to furnish the antitropins which will be capable of undertaking the services required ;

(c) What procedures we ought to adopt in connection with the standardisation, dosage, and administration of the typhoid vaccine.

Before embarking upon the consideration of the first of these questions it will be well to realise the following facts with regard to the different ways in which antitropins may render protective service to the organism :—

(1) An antitropin may combine with the chemical element to which it stands in antitropic relation—we may hereafter

speak of every such element as a *conjugin*—in such a manner as to throw it out of solution. An antitropin which undertakes this office is technically denoted a *precipitin*.

(2) In the case where the conjugin is a poisonous element, the antitropin may combine with it in such a manner as to deprive it of its toxicity. An antitropin which undertakes this office may, without reference to the derivation of its poisonous conjugin, be denoted an *antitoxine*.

(3) In the case where the conjugin is a constituent of a formed element, an antitropin may combine with it as to cause the formed element to agglutinate when immersed in a sufficiently strong salt-solution.¹

(4) An antitropin may, as I have recently shown in conjunction with Captain Stewart Douglas, I.M.S., modify the particular formed element to which it stands in antitropic relation in such a manner as to render it attractive pabulum to the white blood-corpuscles. An antitropin which performs this office may, as we have suggested, be denoted an *opsonin*.

(5) In the case where the conjugin forms one of the constituent bonds in the “vital ring” of the protoplasm, the combination of the antitropin with the conjugin may involve the shattering of the whole chemical structure of the protoplasm. An antitropin which combines with its conjugin in such a manner as to bring about this chemical disintegration may, in the case where bacteria are the formed elements under consideration, be spoken of as a *bactericidal substance*.

(6) An antitropin which disintegrates a complex molecule in such a manner as to resolve it into soluble elements, is technically denoted a *lysin*. When it brings into solution the haemoglobin of the red blood-corpuscles, it is spoken of as a *haemolysin*. When it brings into solution the protoplasm of bacteria, it is spoken of as a *bacteriolysin*.

(7) In the case where the conjugin forms a constituent bond in the “vital ring” of the protoplasm, and where it further constitutes, when set free, a poisonous element, the antitropin, while it shatters the structure of the molecule by entering into chemical combination with its conjugin, may at the same time quench the toxic properties of that conjugin. *An*

¹ Attention may be called in this connection to the fact that agglutinating reactions manifest themselves only in the presence of salts.

antitropin which fulfils this double office is at one and the same time a bactericidal substance and an antitoxine.

NATURE OF THE SERVICES WHICH WE DESIRE THE TYPHOID ANTITROPINS TO UNDERTAKE IN THE ORGANISM.

What we desire from anti-typoid inoculation is that it shall, if possible, ward off the typhoid attack; failing this, that it shall at least mitigate that attack. The successful achievement of the former object involves the destruction of the typhoid bacillus immediately upon its entry into the system of the patient. The successful achievement of the latter involves the devitalisation of the typhoid bacillus, as soon as may be, after it has effected a lodgment in the system. For the attainment of either the former or the latter purpose, the system must be furnished with antitropins capable of exerting a bactericidal effect upon the typhoid bacillus.

While the achievement of increased bactericidal power must in all cases be the primary object of concern, it is legitimate, as a secondary and subsidiary object, to aim also at the neutralisation of the toxic elements of the bacterial protoplasm, which are set free in the organism in the case where the typhoid attack is not completely warded off. This contingency will be provided for, if we can furnish the organism with antitropins which will perform, in addition to the office of devitalising the typhoid bacillus, also that of quenching the poisonous properties of the elements of the bacterial protoplasm, which pass into solution where the typhoid bacillus is broken up in the organism.

WHAT FORM OF CULTURE OR WHAT BACTERIAL DERIVATIVE WILL INDUCE THE ORGANISM TO FURNISH THE BACTERICIDAL ANTITROPINS WHICH ARE REQUIRED FOR THE PREVENTION OF TYPHOID FEVER.

In order to induce the organism to furnish the bactericidal antitropins which it will require when it is confronted by the typhoid bacillus, we must, as consideration will show, introduce into the body constituents of the protoplasm of the typhoid bacillus, as distinguished from the metabolic products which

may have been elaborated by the microorganism in the course of its cultivation.

Having recognised that the vaccine employed for anti-typhoid inoculation must contain constituents of the bacterial protoplasm, we have still to decide in what particular form these shall be administered.

In making our election between the different varieties of vaccines which might be brought into application we may take as our guide either tradition and *a priori* considerations, or, emancipating ourselves from these, the data furnished by a qualitative and quantitative determination of the antitropins which are elaborated in response to each particular variety of vaccine.

If we conform to the practice adopted in the earliest preventive inoculations, we must employ, as in the case of the Pasteurian inoculations against anthrax, and in the case of the anti-cholera inoculations of Haffkine—which were modelled upon the Pasteurian pattern—cultures of living attenuated microorganisms. It is unnecessary to point out that such a course would in the case of the typhoid bacilli which we are here considering entail grave risks : viz. (a) the risk of disseminating the germ of the disease, and (b) that of communicating the disease in a serious form in any case where by mischance we happen to encounter a patient who possesses an abnormal susceptibility to the typhoid infection.

If while discounting the Pasteurian principle of the necessity of employing living microorganisms we still cling to the view that every method which involves a chemical alteration of the bacterial protoplasm is a blemish upon a vaccination-procedure, we may feel ourselves constrained to resort to devices for devitalising our bacteria without exposing them to the action of heat or antiseptics.

Such a restriction would involve us in grave inconveniences which are associated with the proposed method of Macfadyen. It would, on the one hand, involve the complicated apparatus which is required for the trituration of bacteria ; and, on the other hand, it would deprive us of the security against contamination and against the risk of communicating the typhoid infection, which is obtained by the employment of cultures which have been devitalised by heat.

If, lastly, we are prepared to accept evidence of the production of the desired antitropic substances as proof of the efficacy of the vaccine, we shall find ourselves, as the reader will realise at the end of the next section, and again when we come to deal with the statistics of anti-typhoid inoculation, free to employ for our inoculations cultures which have been sterilised by exposure to a temperature of not more than 60° C.

It will be unnecessary to point out to anyone who has practical experience of such matters the manifold advantages which result from the employment of such sterilised cultures.

DOES THE INOCULATION OF A TYPHOID CULTURE WHICH HAS BEEN STERILISED BY EXPOSURE TO A TEMPERATURE OF 60° C. INDUCE IN THE ORGANISM THE ELABORATION OF THE TYPHOTROPIC SUBSTANCES WHICH ARE REQUIRED FOR THE PREVENTION AND MITIGATION OF THE TYPHOID ATTACK ?

I may appropriately open the consideration of this question by pointing out that the suggestion that preventive inoculations should be undertaken against typhoid fever upon the Pasteurian system—a suggestion which was originally made to me by Mr. Haffkine—was, considering the risk which seemed to me to attach to such a process, destined, so far as I was concerned, to remain indefinitely inoperative. The whole aspect of this suggestion was immediately changed as soon as I learned in the course of conversation with Professor R. Pfeiffer that he had in man obtained the specific agglutination-reaction to typhoid by the subcutaneous inoculation of a heated typhoid culture. This observation, since it pointed to the continued presence of effective vaccinating elements in the heated culture, immediately supplied the basis for the system of anti-typhoid inoculation which I have employed.¹

In the course of the researches which have been carried on by me, so far as time and opportunity have allowed, during

¹ It may be observed that Professor Pfeiffer also recognised that his observation with regard to the production of agglutinins by inoculation of sterilised cultures had opened the way to anti-typhoid inoculation. The results of two experimental anti-typhoid inoculations were published by him shortly after the publication of my first two anti-typhoid inoculations (*Lance* September 19, 1896).

the last six and a half years, further evidence has accumulated in my hands with regard to the integrity of the vaccinating elements in typhoid cultures which have been subjected to the action of heat. The facts may be grouped under two headings :—(a) facts showing that the typhoid culture is unaltered so far as its immunising properties are concerned by exposure to the temperature which is required for the devitalisation of the bacteria ; and (b) facts showing that the chemical relations which obtain between the protective substances of the blood and the unheated typhoid bacillus, obtain also between these protective substances and the typhoid bacillus after it has been devitalised by exposure to a temperature of 60° C.

OBSERVATIONS WHICH SHOW THAT THE TYPHOID CULTURE PRESERVES ITS VACCINATING EFFICACY AFTER EXPOSURE TO A TEMPERATURE OF 60°-65° C.

The truth of the proposition that the typhoid culture preserves its vaccinating efficacy after exposure to a temperature of 60° C. is established—

(a) by the fact that the bactericidal power of the blood is increased—sometimes as much as one-thousandfold—as the result of a single inoculation of a suitable quantum of a sterilised typhoid culture (*Lancet*, September 14, 1901) ;

(b) by the fact that an increased bacteriolytic power is developed in the blood of patients who have been inoculated with a suitable quantum of such sterilised typhoid cultures ;¹

(c) by the fact that a patient who has recovered from a first inoculation of a sterilised typhoid culture does not upon second inoculation suffer from the very severe constitutional intoxication which would supervene in the case of an uninoculated person inoculated with this dose of typhoid vaccine.

(d) by the fact that an increased opsonic power is

¹ This may be demonstrated by making a series of progressive dilutions of the serum of a normal and of a vaccinated person, and mixing in each case the successive dilutions of serum with equivalent volumes of culture in a capillary tube. On examining microscopically films made with the contents of the capillary tube after the serum has been allowed to act upon the bacteria for half an hour at blood-heat, it will be found that the bacteriolytic effect has manifested itself in a much higher dilution in the case of the serum obtained from the inoculated patient, than in the case of the serum obtained from a normal person who acts as control.

developed in the blood of patients who have been inoculated with a suitable quantum of sterilised typhoid culture.

We have in (a) and (b) evidence of the elaboration of antitropins which exert a destructive effect on the typhoid bacillus; in (c) evidence of the elaboration of antitropic substances which discharge the office of antitoxines, and in (d) evidence of the elaboration of opsonic antitropins.

Summarising the above, we see that inoculation of cultures of typhoid bacilli which have been sterilised by exposure to a temperature of 60° C. induces in the organism an elaboration of—

- (a) Agglutinating antitropins;
- (b) Bactericidal antitropins;
- (c) Bacteriolytic antitropins;
- (d) Antitoxic antitropins;
- (e) Opsonic antitropins.

OBSERVATIONS WHICH SHOW THAT THE CHEMICAL RELATIONS WHICH OBTAIN BETWEEN THE PROTECTIVE SUBSTANCES OF THE BLOOD AND UNHEATED TYPHOID CULTURES OBTAIN ALSO BETWEEN THESE PROTECTIVE SUBSTANCES AND TYPHOID CULTURES WHICH HAVE BEEN EXPOSED TO A TEMPERATURE OF 60° C.

The evidence under this heading is furnished by the fact that the agglutinating and bacteriolytic effects which are exerted upon living typhoid cultures by the protective substances of the blood, are exerted also, but in a somewhat diminished degree, upon typhoid cultures which have been sterilised by exposure to a temperature of 60° C.

In sharp contrast with what occurs when the serum is brought into contact with cultures which have been sterilised at 60° C. is the entire absence of bacteriolysis in the case of cultures which have been heated to 72° C. before exposure to the action of the serum.

CONCLUSIONS WHICH CAN BE DRAWN FROM THE EVIDENCE FURNISHED UNDER THE TWO PRECEDING HEADINGS.

The concordant observations which have been set forth in the two preceding sections of this paper establish in a very clear manner that the vaccinating elements in the typhoid

culture are maintained practically intact after exposure to a temperature of 60° C.

It is interesting to bring into relation with the experimental data with regard to the typhoid bacillus which have been set forth above, the experimental data relative to the red blood-corpuscles which have been very kindly placed at my disposal by Dr. Bulloch. In the course of experimentation upon the effect exerted by temperature upon the elements in the red blood-corpuscles which induce an elaboration of haemolytic antitropins in the animal organism, it has been observed by Dr. Bulloch that the efficacy of these vaccinating elements is preserved, though it is somewhat diminished by exposure to a temperature of 60° C. Exposure to a coagulating temperature of 72° C.—and it will be noted that this is the same as that referred to above in connection with the typhoid bacillus—completely abolishes the immunising properties of the red blood-corpuscle.

DIFFICULTIES WHICH STAND IN THE WAY OF THE RESOLUTION OF THE QUESTION AS TO WHAT FORM OF ANTI-TYPHOID VACCINE IS ABSOLUTELY THE BEST.

It will round off what has been said above in connection with the choice of a typhoid vaccine if I point out here that the problem as to what is the absolutely best anti-typoid vaccine is a question to which the answer will be obtained only after very long and laborious experimentation. The sources of fallacy which are incident to an experimental investigation of the question may be brought before the reader's mind by the following illustration. While the character of the harvest constitutes conclusive proof that the proper variety of seed has been chosen, the fact that in a particular case the harvest has been plentiful, and has been specially rich in certain elements, does not constitute demonstration of particular virtues in the seed. The special character of the soil, the methods followed in the sowing, are capable of exerting a very sensible effect. In other words, the harvest of antitropins which is reaped in any particular instance will be dependent upon the individual idiosyncrasy of the patient, and upon the system of dosage which has been adopted. It must therefore be reserved for the future to determine whether

the simple sterilised typhoid culture, such as I employ, constitutes the ideally-best anti-typoid vaccine. For the present we must content ourselves with the fact that sterilised typhoid cultures have been shown to constitute a vaccine which will induce elaboration of the special varieties of anti-tropins that are required for the protection of the organism against typhoid. It will presently emerge that the practical efficacy of the vaccine is borne out in a very distinct manner by the statistical records that set forth the results obtained by the actual practice of typhoid inoculation.

ON THE METHOD OF MAKING THE REQUIRED MASS-CULTURES AND THE PROCEDURES (A) FOR TESTING THE PURITY OF THESE CULTURES ; (B) FOR STERILISING ; AND (C) FOR DECANTING THEM WITHOUT RISK OF CONTAMINATION.

It will be unnecessary here to detail the technique which has been employed for obtaining a pure and perfectly sterile typhoid vaccine. It is sufficient to note that the procedures which were described by me in conjunction with my sometime colleague, Major W. B. Leishman, R.A.M.C., in the *British Medical Journal* of January 20, 1900, have stood the severe test which was imposed upon them by the enormous demand for anti-typoid vaccine which arose in connection with the South African campaign. It will suffice to say that in all 400,000 doses of anti-typoid vaccine were requisitioned for the Pathological Laboratory of the Army Medical School, Netley, and that all these were prepared by the methods referred to above.

Evidence of the adequacy of the measures taken to secure the sterility of the vaccine is afforded by the fact that when after the war the unused vaccine was returned to store at Netley, the untouched bottles, so far as they were examined, were in every case found to be sterile. Perhaps even more satisfactory evidence of the adequacy of the system of technique which was employed is afforded by the fact that no case of septic trouble complicating inoculation was reported in connection with the inoculations undertaken in the course of the war. These inoculations may perhaps have numbered somewhere about 100,000.

STANDARDISATION OF THE VACCINE.

It is necessary to distinguish between standardisation and dosage ; and it will be convenient to deal first with the former. Standardisation has for its object the determination of the strength of one vaccine in terms of another vaccine, the dose of which has been determined by experiments undertaken upon man.

The following are the systems of standardisation which have from time to time been employed :—

(a) In the earliest inoculations, conducted in conjunction with Lieut.-Col. D. Semple, R.A.M.C., the virulence of the culture was in the first instance elicited by determining the fatal dose of that culture inoculated living into guinea-pigs of a standard weight of 250 grammes. The amount of sterilised vaccine employed for the inoculation was then adjusted in such a manner as to stand in relation with the amount of agar-culture which constituted the fatal dose for 100 grammes of guinea-pig.

(b) In the case of most of the vaccine sent out in connection with the South African war, a double process of standardisation was adopted. The toxic effect of the completed vaccine¹ was elicited upon a series of guinea-pigs. As a further control the opacity of the vaccine was measured by means of a simple and ingenious piece of apparatus devised for this purpose by my colleague, Major Leishman, R.A.M.C.

Neither of these last-mentioned tests was completely satisfactory. It was found that the resistance of the guinea-pig to the toxic effects of the vaccine was an extremely variable factor, also that the measurement of the opacity was occasionally vitiated by autolytic processes which took place in the course of the cultivation. Thus it became advisable—and this was carried out wherever practicable—to control the tests which have just been described by the determination of the toxic effect exerted by the vaccine upon man. In particular it was found desirable to do this in the case where a typhoid culture which had been cultivated for prolonged periods on artificial media was replaced by a typhoid culture recently isolated from the organism.

¹ This now consisted of a sterilised and carbolised broth-culture, which had been cultivated for 10 to 21 days.

(c) For the methods of standardisation described above I have recently substituted a much more satisfactory method. I now elicit the number of bacilli contained in the culture by enumeration under the microscope. With a view to forestalling autolysis I have recently employed in every case 24-hour cultures. With a view to avoiding the source of disturbance which is associated with the change of culture and with a view to facilitating enumeration, I employ now exclusively a strain of culture which yields within a 24-hour limit of growth, under favourable circumstances, cultivations containing from 1,000 to 2,000 or more millions of bacilli in the cubic centimetre.¹

¹ The method of enumeration here referred to is that described by me in the *Lancet* for July 5, 1902. For the purpose of the enumeration a measured volume of culture is mixed in a capillary tube with a measured volume of blood. The relative numbers of red blood-corpuscles and bacteria in the mixture is then elicited by enumeration of a certain number of fields under an oil-immersion lens. The result of the enumeration is arrived at by taking into consideration the fact that the red blood-corpuscles in 1 cc. of blood number 5,000,000,000.

(*To be continued.*)



TWO LECTURES ON ECZEMA.¹

By ARTHUR WHITFIELD, M.D. (LOND.), M.R.C.P.,

*Assistant Physician in charge of the Skin Department, King's College Hospital ;
Physician to the Skin Department, Great Northern Central Hospital.*

LECTURE I.

[With Plates I.—III.]

GENTLEMEN,

THE clinical condition, or rather the series of clinical conditions which are denoted by the term eczema, are so frequent that they form at least one quarter of all cases of skin-disease. Within the last ten years an immense amount of patient research has been carried out in order to discover the cause or causes of eczema, and although it cannot be said that the exact ætiology has thereby been established, yet I think it has brought us appreciably nearer to a reasonable conception of the morbid processes at work. It is therefore my purpose, if you will grant me your attention, to endeavour to summarise some of the conclusions reached, and to show their importance in determining the variety of treatment which is likely to be of most benefit. I should like to point out at the beginning that although in very many cases one may, from mere past experience, prophesy the line of treatment which will be most beneficially employed, yet if no pains are taken to get at the factors giving rise to the outbreak, it is most probable that the trouble will arise again and again.

In order to clear the ground, it is necessary to state at the outset what forms of eruption we are to include under the term eczema. Some authorities prefer to exclude all cases which are the direct result of an obvious external cause, such as the irritation produced by some noxious substance, and to group all these under the heading of traumatic dermatitis. We are met, however, it seems to me, by a difficulty, if we do this. We see, for instance, a case of what appears to be

¹ Delivered at the Medical Graduates' College and Polyclinic, November 23 and 24, 1903.

PLATE I.



Fig. I. Acute Dermatitis from Oxalic Acid. First attack.



chronic eczema of the hands. If the patient is one who is in the habit of using more or less irritating substances—let us suppose that she is a laundress, for example—we must call the case "soda" dermatitis; whereas if she is a person of leisure and is not in the habit of exposing her hands to any rough treatment, then the disease is eczema. Later, I hope to give instances which are striking examples of this difficulty; for the present I may content myself with stating that for the purpose of these lectures I shall consider any eruption as eczema which falls within the range of the clinical description. On the other hand, it is usual to see skin which has been exposed to some very strong irritant inflame in such a way that the clinical picture at once suggests the question, "What irritant has been applied to produce this disturbance (Fig. 1)?" Only when the irritant is of less strength or has been frequently applied, does the case become indistinguishable from eczema due to other causes; and on this point also I shall have more to say.

Passing on to the ætiology of eczema, we find that this is an extremely complex matter. Bulkley, in his monograph on the subject, classifies the causes of eczema into predisposing and exciting, internal and external; and finally arrives at a list which may be summarised by saying that the internal causes include every deviation from the normal standard of health, while the external causes include every fault of skin-hygiene. This is, I believe, more or less true; but in such a case the value of the list is largely lost, as it becomes almost impossible to assign any particular cause to the disease, for most people have some slight defect of health and few live under ideal circumstances.

Some time back, the cause of eczema was almost universally believed to lie in an evil state of the blood and fluids generally, and the eruption was considered to be due to an attempt on the part of the skin to "throw off" the poison in an outward direction. Soon after this, and largely owing to the good results to be obtained by local treatment, as opposed to constitutional, it became the fashion to regard eczema as a purely local disease. Later again, came from Hamburg the doctrine of the specific parasite, and this is now in its turn practically overthrown. If we come to close quarters with the facts, we

shall, I think, find that we do in reality know a good deal about the aetiology of eczema, though we do not know all, and never shall, until the chemistry of the various auto-toxæmias is exactly worked out. In the first place, it will, I think, be admitted that the child is never born with an eczematous eruption on its skin—a point of some interest and importance. We do, however, find children born with a strong tendency to develop eczema from very slight or apparently slight causes ; and we also know that the skin of infants is a very delicate structure and that errors of digestion are particularly common. Secondly, we find children born with a disease known as ichthyosis, or with a tendency to develop this disease a little later, and that these children are those who furnish the most intractable cases of eczema. Now although ichthyosis is a disease whose aetiology is unknown to us, yet we do not believe it to be due to an internal toxæmia, but rather regard it as a developmental deformity. One of its most important symptoms is that the horny layer of the skin is seldom, if ever, continuous, and that the natural secretions are less than normal, or absent. Other persons seem, from their youth up, to suffer from excessive secretion, and these again are particularly liable to be attacked by eczema. In these cases we have, then, a visible defect or abnormality of the skin which acts as a predisposing cause to eczema ; but there are also others in whom we do not find these obvious abnormalities, and who yet are sufferers in the same way. As regards the way in which these two obvious deviations from the normal act, we may believe that in the case of the ichthyotic patient the slight itching which usually accompanies the condition keeps up a chronic irritation, or rather perhaps is the sign of a chronic irritation, of the cutaneous nerves, while the insufficient horny layer renders the skin liable to repeated infection by any organisms which happen to fall upon it. On the other hand, the excessive secretion of the other patient is liable to become decomposed by these organisms, with the formation of a chemical irritant. We know that the skin has many organisms scattered thickly over its surface, but I would caution you against believing that they are in a state of active growth. They are rather lying upon and among the superficial cells of the horny layer, and in the natural crevices at the mouths of the hair- and sebaceous

follicles. If therefore any abrasion takes place, with the consequent outpouring of serum or blood, we have at once the suitable medium for their growth ; and then, and not till then, do they begin to grow and produce deleterious effects. In this way it is easy to see that an ichthyotic patient, with his dry and fissured skin, is liable to repeated, and eventually to chronic infection of the cutaneous surface. The patients with a naturally profuse secretion are liable to be attacked by eczema, as has been already observed, rather from the chemical decomposition of the secretion than by direct infection of the skin itself ; and I believe that, if these patients could be kept sterilised without irritating them, they would not suffer.

If we now pass on to the consideration of "occupation dermatitis," or eczema as I prefer to call it, we find many points of the deepest interest. In the first place, we find extremely different degrees of susceptibility to the irritant, and in this connection I should like to draw your attention to some remarks of Professor Jadassohn's in a recent monograph on the subject. Taking a generally irritating substance, we find that a certain dose of it will produce irritation in most skins. This may be termed the normal dose, and skins reacting to it may be termed normal skins. Then there will be found a large proportion of skins which show a reaction to smaller doses—of course not all to an equal dose,—and these may be termed hypersensitive skins. On the other hand, there are certain people who react in a specific manner to substances which are not irritants at all to most people, and these may be said to have an idiosyncrasy against the particular substance. Thus, many people may be rubbed with iodoform until they are abraded, without producing more than a mechanical trauma ; whereas others exhibit the most violent cutaneous inflammation if a single crystal be left in contact with their skin for a few hours. Simple hypersensitivity may be general, in which case the tolerance of all irritants is subnormal, or special, so that, while reacting normally to most irritants, they show an undue susceptibility to one. General hypersensitivity is usually seen in individuals with thin delicate skins ; and it is especially in the more delicate parts, such as the flexures of the joints, that it is most marked. These subjects are also not infrequently people with a general tendency to excitability

of the nervous system. In true idiosyncrasy, on the other hand, the phenomenon usually appears in connection with one substance alone, and it is very rare to find a subject with an idiosyncrasy against many substances. These facts appear to be of the greatest importance from the point of view of preventing further attacks, and the following is a good illustrative case :—A medical man consulted me for an attack of acute eczema, to which he was very liable, and the following history was elicited :—He had never suffered from any form of skin-trouble until he became a medical student, when he acquired it on the hands from the arsenic used in preserving the bodies for dissection. On leaving the dissecting-room, he got well, but was again attacked in his period of dressership from the use of antiseptics. Again the trouble disappeared, but came on later, when I saw him. I then found that he was doing a lot of histological work and using a great deal of acid for decalcification. He found that when he sweated profusely in the laboratory—as he was apt to do, for his room often became very hot—he was sure to develop an attack of acute eczema, whereas the sweating of hard exercise in the open air did not bring on any attack. I thought, therefore, that it was possible that the sweat dissolved the acid which was evaporating in the air, and thus brought it into close contact with his skin ; and working on this hypothesis I advised him, when the parts had recovered, to use a dusting powder composed of the insoluble alkalies, magnesium and bismuth carbonate, in the hope of fixing any acid and rendering it inert. This was, of course, a very rough method of dealing with the case, but it was so far successful that the attacks got less and less virulent, until I believe they ceased entirely. This is a good example of a general hypersensitiveness.

Another instance may be quoted to show an instance of what was at first an acquired special hypersensitiveness, but which later became general. A resident medical officer, who had been working hard in several hospitals and had had to use a great deal of perchloride of mercury, eventually became attacked by an acute eruption in the hands. The first outbreak could hardly be called eczema, since it consisted of huge vesicles and pustules not conforming to our clinical conception of the disease. The acute symptoms subsided, but the skin did

not return to normal, and shortly afterwards he had an acute attack absolutely indistinguishable from one of ordinary acute eczema. After this, the slightest contact with perchloride was sufficient to provoke an outbreak. I advised him to substitute lysol, and this was for a time successful; but after a comparatively short interval of calm, the lysol became as noxious to him as the perchloride, and during the latter part of his residence he was constantly suffering from attacks. Yet on taking a holiday and playing a great deal of golf, the friction of the clubs on the tender new horny layer had no deleterious action at all, the skin on the contrary returning apparently completely to the normal. This might be claimed to be due to the complete restoration to health consequent on his spending a good holiday at a healthy country place and taking an abundance of exercise. I do not, however, think that this is the true explanation, because on his return, while still under the influence of his holiday and in the best of health, he immediately became affected as before on the first contact with the antiseptics.

The small size of the dose necessary to produce these eruptions is almost incredible, and I am prepared for a little scepticism on the part of my hearers with regard to the theory which I formed in the first case, of acid becoming dissolved from the air in the sweat. I therefore wish to quote to you two other cases of much more marvellous character reported by two distinct and competent observers.

The first case is taken from Dr. James White's work on traumatic dermatitis. A child, six years of age, had been twice poisoned by the *Rhus toxicodendron* or American poison-ivy. His parents therefore instructed a servant-boy, who was insusceptible to the poison, to pull up all the roots of the plant that could be found round the house. Having finished this, he was made to wash his hands with hot water and soap and afterwards with vinegar, and his mistress, fearing that in spite of his supposed insusceptibility such a very prolonged contact with the plant might do him some harm, stood over him and watched him at the washing. In the afternoon of the same day he took the child, who had already suffered from the effects of the plant, for a bath, and while he was in the water held him by the armpits and rubbed his back with his hands. Two or three days later the child was affected with the severest form

of ivy-poisoning commencing in these parts, and died in consequence.

The second case is one reported by Dr. Arthur J. Hall in the *British Journal of Dermatology*. The patient was a man, aged 30 years, a demonstrator in a chemical laboratory. He had always been perfectly healthy, and had never suffered from any skin-eruption ; nor was there any history of skin-troubles in his family. He then began to suffer from slight eczema between the fingers, which got progressively worse. After a considerable time he identified phenyl-hydrazin as the specific agent causing his trouble ; and on giving up working with it, he was for a time quite free from the eruption. One evening he had a fresh outbreak, and on inquiry he found that a student had been using the body in his laboratory, though it was against his orders. Again, having the necessity to do some research upon the subject, he got his assistant to do the actual manipulation, while he remained in an adjacent room, which was not connected with the laboratory. The assistant came, on completion of the work, and stood talking to him for some time, with the result that he had another severe outbreak that evening. While convalescing from this attack, the assistant came to see him, a distance of over a mile, and conversed with him for about ten minutes, and even this was followed by a relapse.

In commenting upon this case, Dr. Hall protests, in my opinion rightly, against the arbitrary separation of such cases from eczema. In both of these cases we have an idiosyncrasy. In the former, the plant in question is irritant to most people, but there are many who are quite insusceptible, as was the boy who was employed in exterminating the plant. In the latter, it seems that the demonstrator was the only individual in the laboratory who was susceptible. It is interesting to note how this susceptibility increased, the child who had recovered from two attacks dying as the result of the third, although in all probability a much smaller dose was received, and the chemist who began, while actually working with the body, to suffer from slight eczema, eventually becoming so sensitive that a wide-spread and severe eruption followed what must have been an infinitesimal dose.

On the other hand, it is not uncommon to see the converse

happen, though usually only with severe corrosive poisons. A patient may have, as his first attack, a very marked pustular and bullous dermatitis, not accurately corresponding with our conception of eczema, and this may subsequently run on into an eruption which is typically eczematous in character.

In apportioning to the various irritants their proper share of the cause, we must invariably bear in mind that, when once the horny layer is broken and serum exudes, we have all the conditions necessary for the active growth of the micro-organisms lying on the surface, and these may keep up the condition started by the trauma. The case is then analogous to a septic cut on the finger. The incision was due to the knife, but the persistence of the open wound is due to the microorganisms ; similarly, in certain cases of skin-eruption, the original outbreak was due to some non-organised irritant, but the persistence of the condition is kept up by the subsequent infection. This leads us naturally to the part played by the microorganisms of suppuration in the production of eczema.

From the researches of Balzer and Griffon, Sabouraud and others it is now known that the *Streptococcus pyogenes* causes, when inoculated beneath the horny layer, that vesiculo-bullous eruption which we know as *impetigo contagiosa*, while the *staphylococcus* is usually, if not invariably, responsible for the small pustules, generally in the neighbourhood of the hair-follicles, which are now known as the *impetigo* of Bockhart. Where the skin is in a healthy condition, these lesions are of a somewhat ephemeral nature, though owing to their auto-inoculability they are liable to be reproduced almost indefinitely over the surface of the body. If, however, the resistance of the patient generally or of his skin especially be lowered from continued irritation, the acute infection, instead of clearing up locally, may pass into a chronic stage ; and I believe that a widespread acute infection of *impetigo* may itself sufficiently lower the resistance of the skin to cause a failure in the return to normal and the supervention of a chronic infection.

Such infections may almost imperceptibly pass over into eczema, when regarded from a clinical point of view. Here is the photograph of the back of the knee of a small boy who came to the hospital suffering at first from a rather severe attack of *impetigo contagiosa* (Fig. 2). His health was

apparently perfect, and there was no reason against his making a speedy and complete recovery, other than the facts that his original attack was rather widespread and that he neglected to carry out the principles of treatment, namely, the proper removal of scabs. The result was that his recovery was delayed for some weeks, and he eventually developed the chronic eruption here depicted and very difficult to remove.

In this connection I may refer to an interesting piece of work done by Bender, Bockhart and Gerlach. These observers investigated the action of pure cultures of staphylococci derived from boils and impetigo. They intentionally abstained from using cultures derived from eczematous eruptions, and they expressly state that they leave the question of the specific parasite untouched, merely attempting to add to our knowledge of the relationship of *Staphylococcus pyogenes aureus* to eczema. In discussing the effects of inoculation of these cocci, it is necessary to bear in mind that there are two classes of poison concerned. The first is that contained within the bodies of the organisms themselves, the intrabacillary toxine; and the second is that secreted by the organism into the medium, the extra-bacillary or secreted toxine. This latter is in reality a mixture of secreted bodies, but for our purpose it will be sufficient to speak of the mixture as the secreted toxine. In experimenting with the staphylococci the following precautions were taken. All media for application, in which poisons or organisms were to be contained, were first tried in a sterile condition and without these poisons; and as in every case the results were completely negative, the effects of the subsequent experiments could be legitimately assigned to the actual organisms or toxines present.

Four varieties of preparation were used :—first, pure cultures of cocci grown on solid agar and believed to contain very little, if any, of the secreted toxine; secondly, staphylococci grown in bouillon and subsequently thoroughly washed so that no secreted toxine was present; thirdly, filtered broth in which staphylococci had been grown, and therefore containing the secreted toxine only; lastly, the whole of a bouillon-culture, containing both intrabacillary and secreted toxine in large quantities. Great care was taken to ensure that these preparations were in reality what they were intended to be, and the

PLATE II.



Fig. 2. *Chronic infection after neglected Impetigo contagiosa.*

PLATE III.

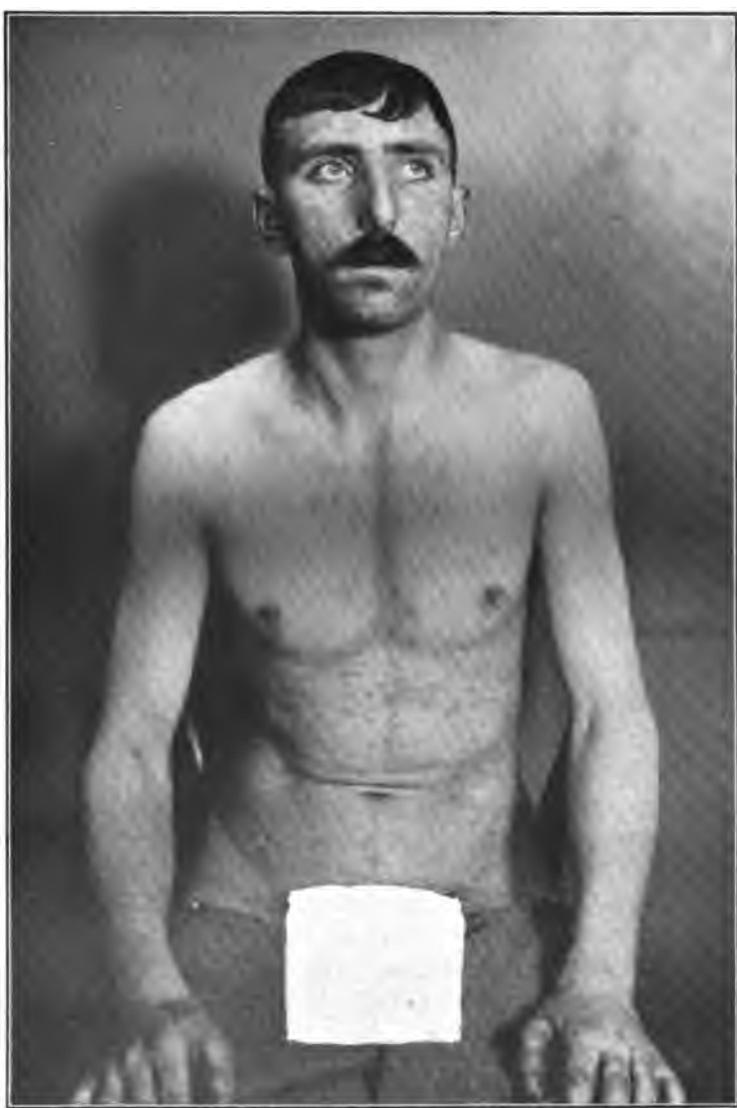


Fig. 3. *Circinate Seborrhoic Eczema ; Onset determined by Scabies.*

three authors of the paper submitted themselves to experiment. Two of these had delicate skins and had on occasions suffered from slight eczema, and the third had a thick resistant skin and had never suffered from any form of eczema.

Using either staphylococci grown on solid media or washed cocci, no results were obtained unless the skin had been previously irritated, and then a crop of pustules was produced. With filtered toxine a typical papular eczema resulted ; while an experiment on the same patient with turpentine-friction resulted in a similar eruption, differing only in the fact that this did not spread beyond the original area of application, while that produced by the filtered toxine did so spread. A third experiment was carried out on the man who had never suffered from any form of eczema. No previous irritation was attempted, and a vesicular eczema was produced, which did not spread beyond the area of application. Fourthly, on the same patient, the same experiment was made with the addition of previous irritation, and the result was a papulo-vesicular eczema. Lastly, the whole broth-culture produced an erythematous vesicular eczema. The absence of the pustulation in the last experiment, although the actual organism was present, was explained by the authors as due to the presence of one of the secreted products, leucocidin, which being present in large amounts paralysed and killed the leucocytes and thus neutralised the attracting (chemotactic) power of the intra-bacillary toxine.

If we consider these experiments in the light of what we have already said, we see at once that the body apparently necessary for the production of an eczematous eruption was a soluble irritant, and that the eczema was not due to the actual infection ; and we also perceive that, given an irritation of the skin sufficient to produce weeping, we have a serum more or less resembling broth, in which the staphylococci normally present on the surface of the skin can grow, thus repeating the last experiment of these authors. We have thus all the conditions present for the production of an eczema and its indefinite persistence. One more case I should like to quote to you before leaving the external causes of eczema—it is that of a man affected with scabies. This patient came to the hospital and complained of a generalised eruption on his arms and trunk. Being rather busy on that afternoon,

I sent him into the retiring-room to strip, without so much as glancing at the exposed parts. On going in to examine him, I found him covered with the circinate rash of eczema seborrhoicum which is seen faintly in the photograph (Fig. 3), and on examining him closely I found that he was suffering from scabies. His history was that the eruption had come out shortly after he began to itch, and had begun on the body and spread up on to his face. Now this eruption is not that of scabies, which does not affect the face in adults, and it is, I admit, not ordinary eczema ; but as to how far we are justified in separating this eruption from that of eczema, I am not quite certain. I incline to think that the importance of seborrhoic eczema is overdone. I could not very well cure his scabies and watch the effect on his eczema, as I knew of no treatment which would cure one without influencing the other ; but I instructed him to use none of the sulphur-ointment, which I prescribed, to his face or head, telling him that they would recover without treatment. After three nunctions of sulphur-ointment, in which he said that he included nothing above his chin, the whole thing died away ; and although I kept an eye on him for some time, there was no tendency to relapse.

From all these facts which I have brought forward, I would venture to lay down the following conclusions :—Eczema may be caused by external irritants alone, when these are of a suitable strength and act for a certain time. Certain skins are from birth of low resisting power, so that their owners are liable to attacks of eczema under circumstances which would not affect normal skins. Other skins have some gross and visible defect, such as ichthyosis or diminished or excessive secretion, which lays them open to more frequent irritation, and they therefore suffer in the same way. By repeated irritation, or more rarely by a single powerful irritation, the resistance of a normal skin may become so lowered that irritants hitherto inefficient become efficient causes of the eruption. When once the resistance is broken down in this way, it can only be restored by prolonged rest and careful protection ; and while this state of acquired low resistance persists, the skin and its reactions are indistinguishable from those of the congenitally susceptible skin.

This completes what I have to say about the external causes, and we will now turn to the internal causes, which I believe in many cases to be of almost equal importance; though I doubt very much whether any one of them is capable of calling forth the eruption in the absence of all forms of external irritant, especially when we include, as we know we must, among the external causes strong light, heat and cold, hard water, and such other daily irritants as we are all in the habit of resisting.

As a probable link between the purely local causes and those of internal origin, I may instance the effects of vaccination. I suppose we have all seen eczema follow vaccination, but the following case seems to me of rather special interest. A lady in late middle-life came to see me for a severe and intractable eczema. She had been vaccinated at the beginning of the recent epidemic, having previously never suffered from any skin-eruption. The vaccination "took" rather severely, and did not heal properly, but left indurated red lumps, which tended to the production of vesicles again and again, constituting the so-called "raspberry tumour" of the American authors. After a week or two of this, however, a vesicular eczema appeared around the vaccination-sites, and after involving the whole of this arm, appeared upon the other, and finally became generalised. This case proved a most rebellious one, and the eruption, which yielded to treatment in most places, held tenaciously to its original position around the vaccination-marks. These lesions were beginning to resolve slowly when I last saw her, and the generalised eruption had disappeared, though now and then there was a threatening of its reappearance. I have always felt that, if I could completely clear up these arm-lesions, the relapses would not occur, as they always spread on the left arm first and then sprang up in other parts. In this case I have no doubt that there was a general toxæmia which lowered her resistance, but that the local irritation at the vaccination-sites prevented the skin from regaining its normal composure.

Of the purely internal causes of the eruption I would place disorder of the alimentary tract in the foreground, using this term to include disorders of the liver and gout as well. In analysing these troubles, it seems to me that they probably

act in two ways: namely, first, by the agency of the nervous system in what we may term a reflex manner, and secondly, by the production of toxic substances which are absorbed into the circulation. As an instance of the former variety, I may call to your mind some of the eruptions which we class under the heading "rosacea." Many of these are, of course, not eczematous, but rather pustular and acneiform in nature, but others are at least what we term seborrhœic, if not true eczema. In this case the ingestion of food is immediately followed by flushing and heat, and sometimes by the appearance of papules on the face; and as in such event there is hardly time for any putrefactive change or the production of a toxine, I think that we must ascribe these symptoms to irritability of the stomach—a theory which works out very well in practice, since in my experience the two most potent drugs in the treatment of this affection are ichthyol, a drug which seems to act everywhere by relieving hyperæmia, and menthol, which is an analgesic and carminative. It is quite common to find that indigestion is not actually present, but that there is a marked history of it in the past; and I believe that here the dyspepsia has upset the vaso-motor system, and that although the dyspepsia has passed off, the normal vascular tone has not yet reappeared, since we find a similar thing occur in urticaria. A man for instance may bring on an attack of urticaria by eating crab once, and this may last for months, when he has surely got rid of all traces of the crab-toxine.

As regards the other forms of dyspepsia, I would only remind you how much more frequently eczema is found in those who overfeed, than in those who get too little. This is especially to be noted in babies, for it is often not so much the quality of the food that is in fault as the quantity, and I think we shall all have observed very many cases of infantile eczema in what we might term otherwise "show babies."

As regards the other disorders of the alimentary tract, it is difficult to estimate their precise value as causes. Certainly, gross liver-disease, such as cirrhosis, and reabsorbed products of hepatic metabolism, such as are seen in obstructive jaundice, are not very frequently associated with eczema; and this is rather interesting with reference to jaundice, since the marked pruritus accompanying it might naturally be supposed to help in the

production of an eczema. As regards gout, there is a great deal of difference of opinion. Personally, I am quite certain that eczema is particularly common among the gouty, and I am also convinced that these subjects also suffer from catarrhs of other membranes. Yet we do not attempt to diagnose a bronchitis as of gouty origin unless we know the patient to be gouty, and I am positive that it is equally impossible to diagnose a gouty eczema from that due to any other cause ; in fact, many of the cases which I have seen labelled with the utmost confidence "gouty eczema" are nothing more or less than scabies. Diabetes and gross kidney-changes are in my experience not particularly often associated with eczema, though one does see the association sometimes ; but in a very large number of tested urines I have been more often wrong in suspecting nephritis from the oedematous appearance of the eyelids, probably due to the cutaneous inflammation, than in finding evidence of nephritis in a case where I have not suspected it. Diabetes does, of course, produce a local eczematous condition on the penis and vulva, but this is a matter of external irritation. With regard to the question of alcohol, which is probably closely allied to the products of erroneous metabolism, I am inclined to think that it can act powerfully as the chief internal cause of eczema apart from any goutiness in the patient ; and we must at all events admit that a drug whose marked action is to cause a paralytic dilatation of the cutaneous vessels, must have a strong effect in keeping up, if not causing, a disease, one of whose chief characteristics is that very symptom.

Apart from the question of dyspepsia comes the question whether certain forms of feeding can cause eczema, and this I should be inclined to answer in the negative, provided that the quantity is moderate. I have seen some of the most intractable cases of eczema in vegetarians, and again I have seen eczema clear up under the "minced beef and hot water" treatment. In this connection it is perhaps worth remembering that the amount of nourishment is very small in the "Salisbury treatment," usually from eight to twenty-four ounces of lean beef, weighed raw, being the only food given in the day.

Next, it is all important that we do not forget to investigate the condition of the nervous system ; and here again it may be

divided into phases. In the first place, there is the generalised disorder that is found after severe nervous shock or due to prolonged nervous strain. A patient of mine who occasionally suffered with eczema of the hands, and whose sons were great hands at winning scholarships, almost invariably had a bad attack when one of these examinations was coming on; and the attack improved of itself directly the result was known. On the other hand, local nerve-irritation rather than central overstrain is quite a usual cause. We are all familiar with the blepharitis which accompanies errors of refraction, and I have not uncommonly seen eczematous changes round the whole eyelid associated with eye-strain. Teething in infants has in my opinion an undoubted effect in keeping up an eczema, but I do not think it can call one forth.

Possibly also that inveterate form of eczema which alternates with spasmodic asthma should be included under the nervous heading, but of this I am doubtful. I have under my care now a young infant with very wide-spread, but not severe, eczema, which dates from a fortnight after birth. His father has bad asthma and slight eczema. The baby suffers also easily from bronchial catarrh, and the sweat-function is almost completely in abeyance, the skin being dry and harsh.

There are many other nervous relations, but it is impossible to enumerate them all, my wish being rather to give you examples to draw your attention to the principle than to give details of every variety.

Lastly, I should like to mention the "lymphatic" subject. These patients, as I understand it, are not necessarily tubercular. They are rather the "candidates" for tuberculosis, as they are called in Germany, and it therefore seems to me to be a mistake to talk about "tubercular eczema," since it is almost certain that the tubercle-bacillus never calls forth a simple eczematous eruption. These patients are, however, particularly liable to such eruptions, and I believe they are in the nature of chronic pus-infections. Wounds easily fester; pediculosis capitis invariably brings on impetigo contagiosa, to which these people are particularly liable; and acute infections have a strong tendency to become chronic, rather than to resolve entirely. If we examine their blood, we not infrequently find that they are deficient in multinuclear

leucocytes, and generally badly armed for the conflict with infection.

I do not pretend to have given a list containing all the causes of eczema, but I have, as far as I could, drawn your attention to what I believe to be the most essential points in the ætiology, and have tried to indicate those factors enquiry into which will be most likely to reward you with success in your treatment. In conclusion, I would impress upon you that the main trouble lies in an undue excitability of the neuro-vascular system of the skin and in a susceptibility to infection. We did not start with a definition of eczema, as I do not think that a good one exists ; but I think we may now provisionally define it as "an acute or chronic serous inflammation of the superficial part of the skin, resulting from an abnormal susceptibility, congenital or acquired, to the action of external irritants."



ON THE DIAGNOSIS OF INCIPIENT CONSUMPTION AND THE CASES SUITABLE FOR SANATORIA.¹

By C. H. CATTLE, M.D. (LOND.), M.R.C.P.,

Hon. Physician to the Notts Consumption Sanatorium, Sherwood Forest, and Assistant Physician to the Nottingham General Hospital.

PART I.

THE doctrine of the curability of consumption has received during the last twenty years the sanction of some of the highest medical authorities, while at earlier periods voices have from time to time been raised in its support. The truth of this doctrine has for various reasons been slow in coming home to the general body of the profession. The late Dr. Wilson Fox, speaking from the clinical side, used to teach us that consumption was often recovered from, and I can remember my own disappointment when, fresh from his teaching, during the early 'eighties of the last century, I found that these cases in my hands steadily got worse, and none of them recovered. A few years later the investigations of Drs. Thomas Harris, Kingston Fowler and others, from the pathological side, threw new light on the question by demonstrating that evidences of healed tubercle were frequently to be met with in bodies of persons who had died of other diseases. Coming down to a still later date—*i.e.*, within the last four or five years—we arrive at what may be called the Sanatorium epoch, when the voice of authority has once more proclaimed the curability of phthisis—perhaps at first a little too confidently; yet I think that at last we, as a profession, are beginning to get some light on the subject and to grasp the conditions under which, so far as present knowledge goes, we can hold out to our patients a rational hope of cure.

"The first stage is the stage of consolidation; the second is the stage of softening; and the third or last is the stage of excavation;" so it is written in the text-books. Wilson Fox used to say: "Gentlemen, I know of no last stage." Most of us have seen extremely chronic cases. I have under my care

¹ Read before the Nottingham Medico-Chirurgical Society.

a woman now, aged 33, whose first symptoms began with haemoptysis when she was 13, and who states that she has been ill, more or less, for the whole of the intervening space of twenty years. For this great length of time have the reparative processes in the lungs kept pace with the destructive changes, and this without the assistance of a sanatorium, without forced feeding, nay, even without fresh air, because the patient has spent her days in a factory and her nights in a narrow court. The saying "I know of no last stage of consumption" may be taken to mean that the disease may conceivably be arrested at any stage, or at least be indefinitely prolonged. Even among hospital out-patients it is sometimes surprising to see fairly extensive disease become quiescent and to all appearance arrested without any special treatment. But experience teaches us that this does not very often happen ; on the contrary, we know that a very large majority of cases with extensive consolidation or commencing excavation go more or less rapidly down-hill. The people whose lungs after death show a slight puckering at one or both apices, or a cretaceous deposit, or a smooth-walled cicatrised cavity, do not belong to the same class as the chronic consumptives, so familiar in the out-patient rooms of our hospitals and dispensaries : the disease in the former class has been altogether latent, or at the most has been manifested by slight and transitory illness, and physical signs may have been absent.

There is no more important problem before the medical profession than the early recognition of consumption. If nature cures many cases without our aid, we have the best reason to believe that many more can be cured by removing the patient from an unhealthy environment to a healthy one, and supporting the healing forces of nature by all means in our power. I am going to record some of my experience as one of the honorary physicians to a sanatorium during the past year and a half ; but the necessity of the early diagnosis of consumption is not only important as regards the success of sanatorium treatment, but as regards the success of any treatment, and of preventive measures as well. In fact, tubercular disease is being manufactured more quickly than it is being cured, and after sanatoria and hospitals have done their utmost, a very large majority of cases must continue to be treated privately.

The sanatorium treatment is no panacea; even early and favourable cases sometimes become worse. Still, speaking generally, the earliest cases do the best, and my practice during the past eighteen months has tended more and more towards the rejection of chronic cases and the discovery of early ones.

The following cases illustrate some of the points in the diagnosis of phthisis to which I am about to draw attention.

Case 1.—This was a girl, aged 20, who first came to me during the winter of 1898–9. She belonged to a healthy family in comfortable circumstances. Her health had suffered in consequence of indoor occupation. She had a persistent dry cough, but no physical signs of disease could be made out. She improved during the following summer, and again came under my notice the next winter. The cough returned, and very gradually slight signs of consolidation appeared at the right apex. She led a very easy life, with abundance of food and fresh air. Her condition did not satisfy me, so she was sent to a sanatorium in February 1900; she remained there three months, and spent a further three months in the country, near Nottingham. At the end of this time all signs of disease had disappeared. Her family removed to the sea-coast in the South of England, and the patient remained quite well until the winter of 1901.

At this time, I am informed, she had a slight relapse, during which crepitations were heard by a doctor. Since this she has remained well for two years. Only recently she came to me for a report on her health, but not because she was ill. Her weight was 7 stone 10 lbs., exactly the same as before she went into the Sanatorium. The site of the old disease was now indicated by a patch of impaired resonance, of the size of half-a-crown, occupying the extreme apex of the right lung, over which the breath-sounds were tubular. There was no cough, râles, or expectoration to indicate active disease. Behind, the breath-sounds were almost normal. At the *left* apex in front the breath-sounds were occasionally jerky, and the heart-sounds were well conducted in this direction.

I formed the opinion that these signs—although consistent with a healed lesion—indicated a certain amount of residual disease, quiescent for the present, and possibly slight extension to the left apex.

The girl is of delicate appearance, flat-chested, with a clear thin skin and mobile vascular and nervous systems. There is no hereditary or family taint ; yet here we find the soil in which tubercle is apt to grow luxuriantly. My first thought was : why after all our care is the disease not extinguished ? But my second thought was : why, after five years, is the patient no worse ?

Case 2.—The brother of the last patient came under my notice three years ago, while the sister was at the Sanatorium. His age was 18, and he was a thin, anaemic, over-grown boy. He had been coughing for six weeks. The apex of the right lung expanded badly ; the expiratory murmur was harsh and prolonged, and there were a few crepitations. He was sent without delay to the same Sanatorium, and afterwards to the same country home. Since this treatment he has remained quite well ; and at the present time is doing office-work in Nottingham without any apparent injury. At the Sanatorium, bacilli were found in both cases, which confirmed the diagnosis.

Case 3.—Mrs. M., a married woman, aged 28, came to me in August 1902. She had not been well since an attack of influenza during the previous winter. She suffered from wasting, night-sweats, troublesome cough and pleuritic pains. On examination there was deficient movement of the left side, and a few crepitations, probably partly pleuritic, were detected at the lower part of the left axilla. She attended for some months as an out-patient without much benefit. She was therefore sent, in April 1903, to the Sherwood Forest Sanatorium, where she at once began to improve. There was no expectoration, and tubercle-bacilli have not been found. At the end of three months the patient looked well, and no signs of disease were discoverable. As, however, ways and means for an extension of the term of treatment were available, it was decided to keep her for another three months, as a precaution against relapse. At the end of this further term the improvement was fully maintained and she was discharged with the disease arrested.

Case 4.—A. W., aged 34, was sent to me by Dr. Buckley with a view to his going to the Sanatorium. Six weeks previously to this he spat up some blood, while riding a bicycle uphill. He did not leave off work, and continued spitting a

little blood. The haemoptysis had ceased when I first saw him ; he had occasional night-sweats, but no cough.

The physical signs were very slight. At the right apex in front, above and below the clavicle, there were crepitations with inspiration, resembling pleuritic creaking, and in the second space near the sternum expiration was prolonged. Behind, the breath-sounds were slightly exaggerated near the inner angle of the scapula. His temperature was normal, and he was at once admitted to the Sanatorium. A few weeks later he was going on satisfactorily.

Case 5.—E. P., aged 18, came to the hospital last July complaining of dyspepsia. Her appearance was somewhat anaemic, but the catamenia were regular. Patient had a short cough, but this fact was only elicited by questioning. The murmurs of anaemia were absent. The only physical sign at the time was alteration in pitch, and prolongation, of the expiratory murmur at the right apex both in front and behind. She was taken into the hospital for observation. There was about one ounce of thick mucoid expectoration *per diem*. After about a month's observation I felt satisfied that there was a slight deposit of tubercle, and the patient was sent to the Sanatorium. While there, crepitations were noticed over the posterior aspect of the apex, thus putting the diagnosis beyond reasonable doubt. In a short time expectoration quite ceased. After three months' treatment the patient still had a cough ; the sounds at the right apex were not altogether satisfactory, and there was still an occasional rise of temperature.

THE PRESENCE OF TUBERCLE-BACILLI IN THE SPUTUM.

This evidence, if obtained, is absolutely certain proof of the presence of tuberculosis in the lungs or some part of the respiratory passages ; but in early cases, where evidence is most wanted, bacilli often cannot be discovered. Even in well-advanced cases the absence of bacilli, taken by itself, cannot be held to negative a diagnosis of tubercle. Dr. Latham examined sputum from a case on eight occasions, making six preparations each time of examination, and only succeeded in finding bacilli at the ninth attempt.¹ I venture to think that this is an amount of pains seldom expended on the search for

¹ *Pulmonary Consumption*, p. 7.

tubercle-bacilli. As a rule, these organisms are not abundant until breaking down of lung-tissue has occurred. When this has commenced, the case is more difficult of cure ; consequently we should not wait for the appearance of tubercle-bacilli in the sputum when other symptoms point strongly to tuberculosis. In none of the above cases was the presence of bacilli made a test-question ; yet there was sufficient evidence of their being tubercular, and bacilli, in some of them, were first found after the diagnosis was made. No doubt where it can be positively asserted that bacilli are present in the sputum, the information may be of great value. But I think the profession has rather got into the habit of sending sputum to the bacteriologist and letting him make the diagnosis. A negative report reassures the doctor and is naturally communicated to the patient ; a week or two later another negative report comes in ; and when at last suspicion ripens into certainty, valuable time has been expended during which the patient might have received more energetic treatment. Dr. Philip¹ of Edinburgh says :— “A week or a month lost may be required to be multiplied many times in relation to the treatment of the disease.”

ABNORMAL PHYSICAL SIGNS.

We must always bear in mind that slight differences between the two apices of the lungs are frequently to be met with even in normal individuals. At the normal right apex there may be slight dulness on percussion, more audible breath-sounds, and more obvious vocal fremitus and vocal resonance. Dr. E. Squire² has lately carefully investigated the physiological differences of the two apices. He found in a number of healthy individuals increased vocal fremitus and resonance at the right apex. The breath-sounds in about one-third of the cases examined were slightly harsher and more audible. These differences depend on differences between the two main bronchi : the right is wider, shorter, and more horizontal than the left ; it enters the lung at a higher level and gives off the bronchus for the upper lobe nearer the trachea than that for the left upper lobe is given off. For these reasons the glottic sounds are better conducted into the right apex. Owing to these peculiarities we are liable to fall into a double error : either, on

¹ *Transactions of the British Congress on Tuberculosis*, Vol. III., p. 209.

² *British Medical Journal*, May 23, 1903.

the one hand, to regard slightly more audible, but normal, sounds at the right apex as pathological, or to look on commencing signs of consolidation as coming within the physiological limit. Dr. Squire and others have found tubercular affection of the right apex considerably more common than of the left, so that it often becomes a delicate question whether sounds, such as increase of vocal resonance or harsh breath-sounds, heard in this situation are indicative of disease or not.

If, on the other hand, there is slight dulness at the left apex, if the breath-sounds, vocal resonance and fremitus equal or exceed in intensity those on the right, there is almost certainly disease. Error is liable to arise in left-handed persons, for in them the left apex is generally less resonant than the right.¹ In order to investigate the whole of the apex, Dr. Auld² advises that percussion be commenced at the outer border of the clavicular attachment of the sterno-mastoid, and continued back to the spine. Thus a resonant strip is marked out across the root of the neck from front to back on each side. In suspected phthisis the whole of these regions should be carefully auscultated. Level with the two upper dorsal spines on each side there is a small area where bronchial breathing can generally be heard, the glottic and tracheal sounds being directly conducted. More anteriorly the sounds are often bronchial on the right side. It is necessary to compare the sounds heard both on quiet and on deep breathing, for in disease the expiratory sound is bronchial on quiet breathing as well as in deep breathing.

EARLY CASES.

We now come to the question,—what constitutes an early case? Here is a statement by a standard authority: "In the majority of cases where, as the result of physical examination, the patient is said to be suffering from phthisis in the first stage, cavities already exist."³ From personal experience I can fully confirm this statement, for I see numerous cases in which the physical signs are those of consolidation, when from collateral evidence I feel sure the disease has gone on to cavitation. The same writer goes on to say that many patients "in whom a

¹ Lloyd-Jones, *British Medical Journal*, October 24, 1903; also Auld, *Ibid.*, October 31, p. 1182.

² *Lancet*, February 14, 1903.

³ Allbutt's *System*, Vol. V., p. 209.

cavity can be diagnosed are in a better condition than others in whom there are only signs of the first stage." It is implied, I suppose, that such a cavity is small, and that there is evidence of arrest of the disease. Unfortunately, the disease is seldom limited to the tissues which slough out to form the original cavity; more frequently fresh nodules of tubercular matter have been formed in the neighbourhood, so that, as time goes on, larger and larger portions of lung are invaded by the bacilli. Dr. Kidd¹ rightly protests against any sub-division of phthisis into the conventional three stages, seeing that they may all be present at the same moment, and that very frequently cases are in the second stage when physical signs only give evidence of the first. If we look upon the earliest lesion of consumption as a small, slowly-growing mass, composed of grey tubercles and air-cells stuffed with catarrhal products, surrounded by healthy lung, it will be obvious that weeks must elapse before such a nodule will give rise to well-marked signs of consolidation. Our object will be to arrest the disease before any great extent of lung has become involved; and with this object in view we must give careful attention to any slight deviation from the normal in the physical signs present in the lungs, to the patient's history, and to collateral symptoms.

In commencing tuberculosis there may be deficient movement of the affected apex, but dulness on percussion is by no means an essential symptom. There may be increased sense of resistance owing to the underlying consolidation, and it is desirable to accustom ourselves to detect slight degrees of this. Bearing in mind the normal variations above alluded to, we should give careful attention to the quality of the breath-sounds. They may be markedly weaker both in front and behind at the affected apex, owing to local blocking of bronchial tubes. In other cases the first sign is a prolonged expiratory murmur, somewhat blowing or high-pitched. When crepitations can be heard, this prolonged expiration receives additional significance. Fine crepitations can often be heard at the end of inspiration; they may also occur during expiration. In any doubtful case the patient ought always to be made to cough vigorously before we can say that crepitations or râles are absent. Another sign which should be looked for is wavy,

¹ Allbutt's *System*, Vol. V., p. 209.

interrupted or "cog-wheel" respiration, either inspiratory, expiratory, or both. It is not peculiar to tubercular disease, but is sometimes a sign of value. For instance, it may indicate commencing consolidation at a new focus in cases already under observation, and as a sign of early disease may be present when cough, wasting, or other general symptoms give rise to suspicion. Again, we sometimes find the heart-sounds better conducted than usual to the apex of one or other lung, and this may occur before definite signs of consolidation are present. None of these slight indications of commencing disease may be sufficient, taken alone, to warrant a diagnosis of tuberculosis; but it is obvious that only by keeping a strict look-out and by attentively watching the smallest deviations from the healthy standard shall we be able to form a correct opinion on this momentous question. If we carefully observe the development of such cases, we shall find interrupted or high-pitched or unduly feeble breath-sounds, supplemented by crepitations, and finally perhaps by loss of percussion-resonance and by increased resistance. This is the completed picture of a case of commencing consolidation of one apex; the sooner we can recognise it the better; and better still if some accidental circumstance, such as a small haemorrhage, helps us to form a finished mental picture of the condition out of a few blurred and indefinite outlines.

It is possible that we may be able to obtain evidence of early tuberculosis by the use of the Röntgen rays, whether by means of the screen or skiagrams. For my own part I am willing to employ every means which promises to help towards early diagnosis. So far, however, in the majority of published cases bearing on this subject, the skiagram has been put forward as confirmatory of the results of auscultatory examination, not as anticipating these. Among recent instructive papers are those by Halls Dally,¹ Lawson,² Green,³ and Bolton.⁴ I quote the following statement by Halls Dally in order to draw attention to it, viz.:—"It is almost certain that pulmonary tuberculosis, which has gone far enough to cause physical signs, is never unilateral." If this bears the

¹ *Lancet*, June 27, 1903.

² *Ibid.*, July 25.

³ *Quarterly Medical Journal*, 1903.

⁴ *British Medical Journal*, October 24, 1903.

test of the criticism which it is sure to evoke, we shall have to modify our notions of what constitutes an early case.

Another means of diagnosis which is occasionally useful is the injection of Koch's tuberculin. Many of the speakers at the London Congress of 1901 approved of the use of tuberculin for this purpose, who did not countenance its employment as a therapeutic measure. The rules and precautions to be observed will be found in Dr. Latham's work.¹

THE PATIENT'S PREVIOUS HISTORY AND PRESENT STATE OF HEALTH.

The signs of early phthisis should always be considered in connection with the patient's past illnesses and present state of health, and, conversely, all patients complaining of a poor state of health—be it due to dyspepsia, anaemia, the results of so-called influenza, or any other cause—should be carefully examined for tuberculosis. Ten years ago the connection between pleurisy and tubercle was hardly more than suspected; nowadays the relationship has been so well established as to make the occurrence of pleurisy a most important factor in the patient's history. It is also very necessary to ascertain whether any instance of consumption has recently occurred in the patient's house, or any case with which he has been in close association. We should carefully enquire for slight attacks of haemoptysis, as this symptom may have occurred in small amount and been forgotten. The death of either parent from phthisis is a fact to which due weight should be attached; but since evidence of the infectious character of the disease has accumulated, the influence of heredity has not the same ætiological importance, amounting almost to fatalism, that it once had.

Patients with commencing consumption do not always cough, or if they do, it is, perhaps, a "stomach cough" that is complained of. The disease is extremely gradual in its development, and not uncommonly the patient suffers from lassitude, dyspepsia, or other ailment before the true nature of the disease is suspected. If we wish to detect consumption in its earliest stage and treat it in the most efficient manner, we must criticise our own diagnosis, and repeatedly examine

¹ *Op. cit.*, p. 28.

our cases of chronic ill-health, especially in persons of young adult age.

The following example of the insidious onset of the disease came under my notice lately :—

Case 6.—A man of twenty-seven had been engaged in mercantile employment in India for five years. While there he had an attack of enteric fever and also dysentery. The first winter after his return to England he suffered continually from dyspepsia, which he attributed to disorder of the liver acquired in the tropics. For this affection he went a voyage on the Mediterranean for a couple of months, and came back worse. His chest was now thoroughly examined, and moist râles and signs of consolidation were found over the right middle and lower lobes behind. The sputa contained tubercle-bacilli.

Among other things, this case illustrates the point that the apices of the lower lobes (*i.e.* the region from about the level of the third dorsal spine and extending downwards between the scapulae) should in all cases be carefully examined. Extension of the disease should be looked for along the septum between the two lobes, that is to say, along an oblique line represented by the border of the scapula when the hand is hooked over the opposite shoulder with the elbow raised.

A quick pulse is often met with in early phthisis, a symptom which has been dignified by the name of "arrhythmic tachycardia." A persistently-quick pulse, even when the other signs are slight or improving, is of unfavourable import. The temperature should always be taken when examining a suspicious case. A little extra exertion in a phthisical person generally causes some pyrexia, which, however, may only be shown by the rectal temperature and not by the oral.

We should carefully criticise in our own minds the statements of patients who tell us that they have been coughing for only a few weeks or months, or that they have one lung slightly affected. It is very easy for the medical attendant to become infected with the *spes phthisica* which imbues the patient. I feel certain that I am making no random statement about this, for over and over again I have been astonished at the extent of disease, as revealed by physical signs, when the patient fully believes he is still in an early stage.

HÆMOPTYSIS.

This is a symptom of special importance in relation to early phthisis, and therefore I have left it for separate consideration. How many patients tell us, "I was all right until I broke that blood-vessel." So latent is the disease in some cases that they actually date their illness from the date of the haemorrhage ; and this is not surprising, seeing that not so very many years ago the same view was held by the medical profession. In reality we know that these initial haemorrhages are due to capillary oozing from a congested area of lung-tissue, or to destruction of the walls of an artery or vein by the tubercular process. The amount of blood may be several ounces, or only a teaspoonful ; but whether large or small, the symptom should excite suspicion. When a patient complains of spitting blood, it goes without saying that all local sources of haemorrhage other than the lungs should be investigated, e.g., the nose, mouth, fauces, pharynx, larynx, bronchi or stomach. After these have been excluded it will be found that in the great majority of cases¹ hæmoptysis—(*i.e.*, early bleeding before physical signs have developed)—signifies tuberculosis. If, however, any of the abnormal auscultatory signs indicative of early disease are present, especially crepitations at the apex, little doubt will remain of the nature of the disease. If, however, no physical signs or symptoms pointing to tuberculosis can be found, the case must be closely watched, with a view to detecting any further development at the earliest possible moment. Of the cases which have early hæmoptysis some may never bleed again, and this seems to be the rule when the strain produced by over-exertion or violent coughing can be avoided. Cases characterised by large and often-repeated haemorrhages have been comparatively rare in my experience. Alcoholism is a most unfavourable factor in tuberculosis of the lungs—the worst bleeder I ever knew was a man who kept a public house. In Case 4, above quoted, the man who began with hæmoptysis, tubercle-bacilli had not at any time been detected in the sputum, after he had been under observation two months. This goes to prove that many cases with slight signs at one apex should be treated as tubercular before the bacillus can be demonstrated.

¹ Latham, *op. cit.*, p. 8, says that out of 386 patients who had an attack of hæmoptysis, 62 did not develop signs of tuberculosis.

The foregoing remarks apply to the diagnosis of ordinary sub-acute cases of the usual insidious type. I do not propose to say anything about acute miliary tuberculosis, acute bronchopneumonic phthisis, or other forms which have an abrupt beginning. But I would venture to give expression to a word of warning with respect to forming a prognosis after only once or twice seeing a case. First appearances may be deceptive, and it is a serious mistake to regard an acute case as one of the ordinary mild type. If any doubt exists, the patient should be put to bed and the symptoms carefully watched, especially the four-hourly temperature-record. Nor is it necessary to enter into the differential diagnosis of tuberculosis from other diseases. We should remember, however, that it is often latent in cases of generalised bronchitis, or masked by emphysema. Pleurisy has already been mentioned as not infrequently a precursor of tuberculosis of the lung, but it must be borne in mind that it may also lead to bronchiectasis. If the sputum is markedly offensive, the diagnosis is simplified; but in some cases of chronic bronchial trouble in young subjects there is abundant muco-purulent sputum, indistinguishable in appearance or odour from phthisical expectoration. In two recent cases of this character which I have met with, I considered them non-tubercular on the grounds of long continuance of symptoms without signs of consolidation, cavity, or serious decline of health, and absence of tubercle-bacilli from the sputum.

PART II.—CASES SUITABLE FOR SANATORIUM TREATMENT.

Only those who have witnessed the wonderful improvement, both general and local, brought about in the condition of consumptives by means of the simple measure of constant exposure to the fresh air, can fully appreciate the curative effect of this mode of treatment. It scarcely matters how far advanced the disease may be, for in a considerable proportion of all cases weight is gained and the spread of disease is checked. Acute cases occasionally quiet down into chronic ones. Dr. Philip¹ has published charts showing how patients with marked wasting, extensive cavitation, and month after month of hectic fever have regained their normal weight and temperature. Treatment extended for periods of six to twelve months,

¹ *Transactions, Brit. Congress on Tuberculosis*, Vol. III., p. 194.

and in all four cases the evening temperature remained obstinately above normal during the earlier months. These examples show what can sometimes be effected even in most unpromising cases. In a sense, therefore, far-advanced cases are suitable for sanatorium treatment and may sometimes be greatly benefited. Such patients in well-to-do circumstances may be sent after due consideration to sanatoria which are in the habit of receiving all sorts of cases—at Nordrach, for instance, no class of consumptives is excluded. The expense at a private sanatorium is considerably beyond the means of the poorer classes, and the length of residence often greater than working people can afford. Dr. Horton-Smith¹ met with two patients who had been under sanatorium treatment for over a year, and one who had undergone it for over two years. The leading authorities recommend a minimum term of six months open-air treatment for the very earliest cases. At the Notts Sanatorium, Sherwood Forest, which is a purely charitable institution, patients stay a minimum term of three months, and some of them, if they can obtain the necessary recommendations, are granted an extension of from one to three months.

If patients in the later stages of consumption can be benefited (I do not say cured) by this mode of treatment, how much greater are the prospects of those who at the onset of the disease are brought under its influence. If it is necessary to detect tuberculosis in the earliest stage in well-to-do patients, it is far more necessary to make an early diagnosis in the poor, both for reasons above indicated, and because in institutions dependent on public support it is incumbent on us to show good results. We have been telling the wealthy and charitable public all over the country that consumption is curable, and they now think it is time to see those who have been cured. What proportion of cases treated sufficiently early ought to recover? Dr. Burton-Fanning² investigated the results obtained in 716 patients all treated in paying sanatoria. Of these only 52 were cases of comparatively slight disease—that is to say, with a lesion limited to one lobe, without clinical signs of cavity. Forty-six, or 88·4 per cent., attained quiescence

¹ PRACTITIONER, September, 1903.

² Transactions, Brit. Congr. on Tuber., Vol. III., p. 199.

of the disease, or relative recovery. The same observer has lately published¹ the results of treatment of 141 better-class patients at Mundesley-on-Sea, the condition of each case being watched for a term of one to five years after discharge. He states that 32·86 per cent. were discharged, able to work, with the disease arrested, among whom very few relapses took place ; and a further 25·17 per cent. were discharged with disease arrested, but unable to work, and among these about one-third relapsed or died. In Germany there are 37,000 sanatorium patients annually, the majority staying three months ; and of these more than 30 per cent. are said to be without relapse or tendency thereto at the end of four years.² We ought to aim at an "80 per cent." of cures, rather than a "30 per cent.," and this can only be accomplished by a rigid exclusion of advanced and doubtful cases. Every case that dies after sanatorium treatment proves the failure of the method in the minds of people not acquainted with its limitations.

I would make the following suggestions as to selection of cases :—

(1) I would go as far as Dr. Burton-Fanning and admit to a model sanatorium cases where the disease is limited to one lobe of one lung without clinical signs of cavity, and where the temperature does not range much above the normal after the patient has been put to rest for a week or two. We must look to the profession to send us cases in a sufficiently early condition. We are not to wait, as Dr. Clifford Allbutt³ warns us, "till the signs are evident to a second year's student." The plan adopted by my colleagues and myself at the Nottingham General Hospital, of taking patients inside for observation before sending them to the sanatorium, is a useful adjunct to the detection of suitable cases. But whether in a hospital or outside, I feel sure that all cases of early phthisis ought to undergo the same preliminary of rest and watching. I not infrequently come across patients with early disease, who are allowed to walk about when they would be far better in bed.

(2) I think that a good many cases of pleurisy, after the active symptoms have subsided, would be better for a three

¹ *Lancet*, August 15, 1903, p. 454.

² B. Fraenkel, *British Medical Journal*, November 14, 1903, p. 1303.

³ *Transactions*, Vol. III., p. 180.

months' course at a sanatorium. We know that a considerable number of pleurisies are tubercular, and there can hardly be any doubt that the disease is latent in the lung at the same time. Such cases in all probability furnish some of the examples of healed tuberculosis. But where we have evidence by the presence of constitutional disturbance, for instance, that a latent lesion is on the way to become evident to physical examination, we ought then to adopt sanatorium treatment.

(3) I have already said that acute cases are not suitable for treatment away from home, unless the acute symptoms subside without great destruction of lung. Cases which show an early tendency to cavity-formation should be ineligible for sanatoria, which aim at cure within a limited period, and I would debar all cases in which a cavity can be recognised clinically, except under special circumstances. I would qualify this statement on behalf of some chronic cases, without haemorrhagic tendency, in which there is evidence of considerable repair. It is well known that in persons who are getting on towards middle age the disease often shows a disposition towards spontaneous arrest ; hence a greater extent of disease may in their case be consistent with the hope of ultimate recovery than in the majority of younger persons. Probably all of us could point out people going about whose lungs have been excavated for years. But it is the exception rather than the rule for cases so far advanced to show any real evidence of arrest. No one would deny that, owing to loss of tissue and the development of fibrosis, cavities may undergo a certain degree of contraction, but, as a rule, while this is taking place, the disease is making ever fresh inroads into other parts of the lung. If advanced cases with cavities are for the most part unsuitable for a sanatorium which aims at permanent improvement or cure, still more ineligible are cases with glycosuria, tubercle of the kidney, ulceration of intestine, or other grave complication. Persons with feeble circulation, or who are liable to bronchial and other catarrhs, are perhaps better treated abroad than in British sanatoria. For such cases Dr. Burton-Fanning¹ considers the east coast unsuitable ; and probably high winds and sudden changes of all sorts would be detrimental.

(4) Either because the disease is too extensive, or the length of residence too short, or because the conditions of life to which

¹ *Lancet*, July 11, 1903.

the patient returns after leaving the sanatorium are unfavourable—whatever be the cause—it is found that a considerable proportion of cases relapse and gradually lose the good that has been obtained. I cannot go into all these reasons at length, but at any rate I think the possibility of relapse ought to enter into our calculations before sending poor patients into sanatoria. This touches on the question of after-care associations, which is a branch of charitable effort destined to considerable extension in the future. Dr. Bulstrode¹ has dealt with the objection that these remedial measures on behalf of consumptives have for their objective the survival of the unfit, that is to say, a contradiction of the law of evolution. I need hardly say that there is a complete answer to this objection. More to my present purpose is to raise the question whether the provision of sanatorium treatment is in all cases the best method of applying charitable assistance for the comparatively poor. This subject was brought home to me in the case of a young woman, aged 27, who was a patient in the Nottingham General Hospital last summer. By the help of a few friends she was able to raise just £20, a sufficient sum to keep her for three months at the Sherwood Forest Sanatorium. Though not an ideal case, I was willing to sanction her going there, but the patient said : “ Will it cure me ? For if not, the money will keep me and allow extra comforts with my friends for twelve months.” So I told her a three months’ course would probably not arrest the disease. Fortunately she can go to a country abode not far from Nottingham, where she can live in the open air and be well fed. I may also mention the case of a young man who came up to the out-patient room. He had both apices affected, and I did not feel disposed to press the sanatorium upon him. I gave him the usual hygienic advice, which included a prescription of rest and the open air. After three or four months I was astonished at the improvement he had made. He said, “ I have spent on extra food all my savings, which amounted to £20, and now I am ready for work.” He is ambitious to become a tramway conductor, but had I known of his thrift and savings, I doubt whether I should have advised such a good investment.

¹ *Lancet*, August 15, 1903, p. 455.

AN ENQUIRY INTO THE VALUE OF THE X-RAYS IN BRONCHIECTASIS.¹

By D. BARTY KING, M.A., M.D., M.R.C.P. (EDIN.).

*Late House-Physician to the Brompton Hospital for Diseases of the Chest, London,
and to the Royal Infirmary, Edinburgh.*

[With Plates IV.-VI.]

IT has been my endeavour to make some enquiries as to the assistance the X-rays might give in revealing the pathological conditions presented to us in cases of Bronchiectasis. Apart from the value they might have in diagnosis, there was the hope that they might open up a new era in the surgical treatment of this condition—hitherto almost a closed chapter in the history of medicine. What has struck me in some of these cases which have been so treated, and which have come to the post-mortem table, has been the failure to reach accurately the bronchiectatic cavity by exploration and subsequent surgical procedures. Anyone who has had any experience of such cases knows the difficulty of definitely locating a saccular cavity, and, what is of greater importance, of determining whether there is more than one cavity present, and if so, what their relations are. In fairly advanced cases of bronchiectasis, it seemed possible that the X-rays might supply us with more information than is obtained by the use of the ordinary clinical methods, and also that they might help to clear up some of those very early cases of bronchiectasis in which the diagnosis is sometimes doubtful.

In those cases which came under my personal notice, the endeavour was made in each case to discover the presence or absence of :—

- (1) Dilated bronchial tubes ;
- (2) Saccular cavities ;
- (3) Foreign bodies ;
- (4) Impaired action of the diaphragm ; and
- (5) A morbid condition of the lung-tissue.

These cases were carefully skiagraphed on several occasions,

¹ Extracted from a Gold Medal Thesis at the University of Edinburgh.

and photographs were taken of every case. Those well-marked cases which were being treated by creasote vapour-baths were usually X-rayed, not only after they had had these baths, and consequently with their bronchial tubes comparatively free from secretion, but before these had been taken, in the hope that the dilated condition of the tubes might be better shown.

The following are the results :—

Dilatation of the Tubes.—In advanced cases where the bronchial tubes were undoubtedly much dilated, as shown by the stethoscope and in some cases revealed afterwards by post-mortem examination, the X-rays failed to reveal their presence. Occasionally, in the early cases of bronchiectasis, where there was little doubt clinically as to the diagnosis, numerous streaks (like rays) were seen spreading out from the root of the affected lung, especially radiating towards the base. This condition was well-marked in all the advanced cases, unless obscured by the dense shadow of the extremely fibrotic lung-tissue. I suspected that these radiating streaks, in all probability, represented the bronchial tubes, but of this I am not yet certain. However, in this connection one has to remember that sometimes this phenomenon is to be seen in cases of pulmonary tuberculosis. When some of the cases which showed these radiating streaks were skigraphed with their bronchial tubes containing much secretion, (*i.e.*, before their creasote-baths were taken), these streaks showed no change.

Saccular or Gangrenous Cavities.—The X-rays failed to reveal saccular or gangrenous cavities, where they were strongly suspected to be present by means of the stethoscope, and by other clinical methods. I have only to point to the case of A. S. F., recorded below, to support this statement. In that case cavities were present in the right lung as large as a hen's egg, and were unrevealed by the X-rays. I believe that the failure to show up these cavities is chiefly due to the extremely fibrotic condition of the lung-tissue associated with these cases.

Condition of the Lung-tissue.—Cases in which the lung-tissue was suspected to be fibrotic, as a result of examination by the ordinary clinical methods, showed under the X-rays varying degrees of density of the shadows according to the extent of the fibrosis present. This was confirmed by the conditions found *post mortem* in fatal cases. In extreme cases of pulmonary

fibrosis the density of the shadow almost obscured the ribs. In one case which showed under the X-rays a slight mottling over the affected lung, the lung-tissue was found *post mortem* to be almost normal, only a very slight degree of fibrosis existing. Undoubtedly the density of the shadow varies with the degree of pulmonary fibrosis.

Foreign Bodies.—For the detection of foreign bodies in the bronchi the X-rays are undoubtedly of use. When the foreign body has been in the bronchus for some time and has caused bronchiectasis, its discovery is not so easy, because of the dense fibrotic lung-tissue surrounding it. In early cases, even when the physical signs may be almost *nil*, the X-rays may be of the utmost value to us in revealing the presence of a foreign body. However, one has to be on one's guard not to make a hasty diagnosis; and in support of this I would point to the case of C. R., recorded below, where a foreign body was supposed to be revealed by the X-rays, but on post-mortem examination no such body existed.

Action of the Diaphragm.—In advanced cases, where the lower lobe was affected, the action of the diaphragm on the affected side was usually much impaired, and in some cases almost *nil*. In extremely fibrotic conditions of the lower lobe the diaphragm was altogether obscured. In most of the early cases the action of the diaphragm on the affected side was slightly impaired.

The angles made by the ribs with the sternum and spine showed nothing characteristic. In some cases, a point of interest was the presence near the root of the affected lung of small, dark, well-defined, almost circular shadows, about the size of a sixpenny piece, which one might look upon as foreign bodies. I have been unable to explain their occurrence, but I would state that one case which showed these shadows was found to have calcareous glands at the root of the affected lung *post mortem*. This was the only case showing this condition under the X-rays, in which I had an opportunity of seeing the lungs at necropsy. That these dark shadows, which look like typical foreign bodies in the lung, may be due to the presence of calcareous glands, one can believe. Two cases which were X-rayed during life and subsequently came to the post-mortem table (*i.e.*, A. S. F. and F. L.), did not show this condition,

and at the necropsy the bronchial glands were indurated and greatly enlarged, but not calcareous. However, in these two cases we must take into account the fact that the density of the X-ray shadow from the fibrotic lung-tissue masked all other shadows.

Another point of interest is the X-ray report in the case of A. S. F. recorded below, where the left lung showed a "diffuse mottling" all over. The "mottling" here seemed to be somewhat different from that which is found associated with pulmonary tuberculosis, and accordingly, in view of the fact that the sputum had been examined on thirteen occasions with negative results, the diagnosis of associated tuberculosis was scouted. However, *post mortem*, the left lung showed diffuse racemose tubercle from apex to base. It must be noted that the stethoscopic examination revealed no abnormal signs whatsoever in that lung.

Apart from other considerations which are to me of decided scientific interest, and which I do not intend to discuss here, the question to be answered is:—Of what practical value are the X-rays in helping us to arrive at a diagnosis, apart from, or in conjunction with, the ordinary clinical methods, and also in enabling us to treat cases of bronchiectasis? In replying to this question I would say, that in early cases of bronchiectasis, especially if they have associated pleurisy or empyema—whether or not there is a history of having "swallowed" a foreign body—the chest should be carefully X-rayed on more than one occasion. If the cause of the disease has been due to a foreign body lying in one of the bronchi, the X-rays will, in the great majority of such cases, reveal its presence and clear up the case, which by the ordinary clinical methods would have been missed.

Again, in most of the cases of bronchiectasis the X-rays invariably confirmed the presence of a morbid process as revealed by ordinary clinical methods, but failed to give us any further information as to its real nature; in fact, they revealed less to us than the stethoscope did.

I would also say, that at present at least, the X-rays are of little or no use to us in the surgical treatment of bronchiectasis.

In conclusion, I have to record my indebtedness to the

physicians of the Brompton Hospital for Diseases of the Chest for their kindness in allowing me to make use of the various cases described here, and also to the late Dr. Barry Blacker, then in charge of the X-ray Department at the Brompton Hospital, who viewed the cases which came under my notice and gave me his skilled opinion.

CASES.

Case 1.—C. R., æt. 17 years. *Diagnosis:* Bronchiectasis : Foreign body in bronchus (?). The sputum contained no tubercle-bacilli, but its smell was very offensive.

Physical Signs.—Over the right lung, anteriorly, from the fourth rib to the base, the percussion-note was very dull, the breathing was slightly tubular, and there were many medium râles. Vocal resonance was increased. At the base the breathing was feeble. Above the fourth rib the breathing was harsh vesicular, with a few rhonchi and medium râles. Posteriorly, from the fifth rib to the base, the percussion-note was dull, and the breathing was tubular. Vocal resonance was increased, and there were many medium râles. Above the fifth rib there were a few medium râles up to the apex.

Over the left lung, anteriorly, the breath-sounds were feeble all over, with a few sibilant rhonchi over the upper half. Posteriorly, there were medium râles from the apex to the fifth dorsal vertebra ; below this many coarse râles.

X-ray Appearances.—There was a mottled appearance of both lungs, especially around and to the left side of the heart. In the middle of a small round shadow on the left side of the apex of the heart was a straight definite shadow about one-and-a-half inches long (?) piece of bone). No cavity was detected.

Post-mortem Examination.—No trace whatever of any foreign body was found. Marked cylindrical bronchiectasis of both lungs was present, especially in the right upper and lower lobes, and also in the left lower lobe. The lung-tissue generally was slightly firmer than normal ; otherwise healthy. Enlarged and indurated glands were present at the root of the lungs.

Case 2.—S. E., æt. 29 years. *Diagnosis :* Bronchiectasis (?) of the right lung. The sputum contained no tubercle-bacilli ; the smell was slightly offensive.

Physical Signs.—Over the right lung, anteriorly, the percussion-note was dull from the third rib to the base, with cavernous breathing. A few creaking râles were audible, vocal resonance was increased, whispering pectoriloquy was present. At the base the breath-sounds were very feeble ; a few medium râles were present in the second intercostal space. Posteriorly, from the fourth dorsal vertebra to the base, the percussion-note was dull, with cavernous breathing and a few medium râles ; vocal resonance was diminished. At the base, the breath-sounds were very feeble. In the interscapular region vocal resonance was increased. The left lung was free.

X-ray Appearances.—Over the left lung, anteriorly, there was opacity from the third rib to the diaphragm, so that the shadow of the diaphragm was indistinguishable. Posteriorly, there was opacity from the sixth dorsal vertebra to the base, merging into the shadow of the diaphragm. The movement of the diaphragm on the left side was good ; the heart lay transversely.

Case 3.—F. H. Diagnosis : Bronchiectasis (?) of the right lung. The sputum contained no tubercle-bacilli ; the smell was offensive occasionally.

Physical Signs.—Over the right lung, anteriorly, from the fourth rib to the base, the percussion-note was very dull, with slightly tubular breathing ; many medium râles were audible. Vocal resonance was increased. Posteriorly, from the fifth dorsal vertebra to the base the percussion-note was very dull ; there was slight tubular breathing, and vocal resonance was increased ; many medium râles were present. The left lung was free.

X-ray Appearances.—A dark patch was seen in the upper part of the right lower lobe, separated from the diaphragm by a bright patch. The former patch was irregularly opaque and about 4 inches by 1½ inches in size.

Case 4. — F. H., æt. 30 years. Diagnosis : Bronchitis Bronchiectasis (?) The sputum contained no tubercle-bacilli ; its smell was offensive.

Physical Signs.—The right lung was free ; the left lung anteriorly, was also free. Posteriorly, the percussion-note was normal all over. From the fourth dorsal vertebra to the base

the breath-sounds were normal, with many fine râles. Vocal resonance was normal.

X-ray Appearances.—Over the middle part of the right lung the ribs are somewhat obscured and the view there is not so clear as usual.

Case 5.—F. W., æt. 30 years. *Diagnosis:* Chronic pulmonary tuberculosis; chronic pneumonia with bronchiectasis in left, upper and lower lobes. Pleural adhesions were present on the right side. The sputum contained tubercle-bacilli, and the smell was offensive. The patient had had pneumonia (lobar) on the left side six months before the onset of the illness.

Physical Signs.—The right lung, anteriorly, was free. Posteriorly, from the second dorsal vertebra to the base, the percussion-note was dull. From the fourth dorsal vertebra to the base the breath-sounds were weak, with a few medium râles.

Over the left lung, anteriorly, from the fourth rib to the base the percussion-note was absolutely dull, and breathing was tubular. A few medium râles were audible and vocal resonance was increased. Posteriorly, from the fourth dorsal vertebra to the base, the percussion-note was absolutely dull, and tubular breathing with hollow creaking râles was audible. Vocal resonance was increased, and whispering pectoriloquy was present.

X-ray Appearances.—The left lung appears nearly opaque, less so at the apex. The apex of the right lung is very brilliant (? cavity). Nothing suggesting of basal adhesions is seen. The diaphragm on right side moves freely.

Case 6.—M. H., æt. 21 years. *Diagnosis:* Sacculated bronchiectasis of the right lower lobe. The sputum contained no tubercle-bacilli; the smell was offensive.

Physical Signs.—The right lung, anteriorly, was free. Posteriorly, from the fourth dorsal vertebra to the base, the percussion-note was dull, with tubular breathing and hollow creaking râles; vocal resonance was increased, and whispering pectoriloquy present. The left lung was free.

X-ray Appearances.—At the base of the right lung there was a dark shadow from the eighth dorsal vertebra to the base, the shadow obscuring the ribs. No fluid movement was visible, and the diaphragm was obscured. The whole of the lung was somewhat opaque. (? Pneumonic condition.)

Case 7.—A. S. F., æt. 16 years. Diagnosis: Chronic pneumonia: bronchiectasis of the right lung. Sputum, no tubercle-bacilli on repeated examination (13 times); smell very offensive. (Figs. 1, 2, 3.)

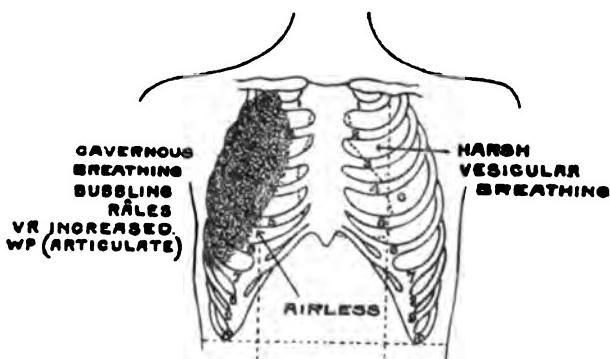


Fig. 1.

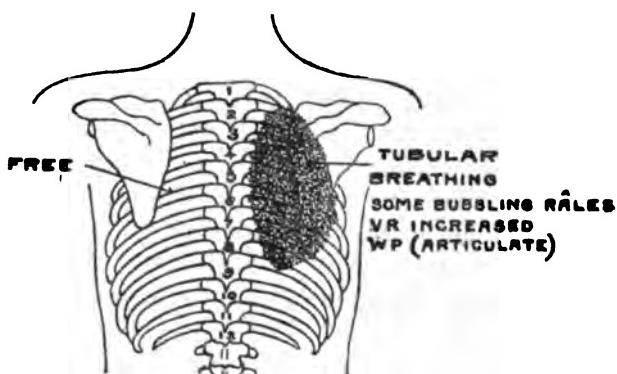


Fig. 2.

The patient had pneumonia (lobar) on the right side one year before the onset of illness.

X-ray Appearances.—Right lung opaque throughout; ribs are just seen, diaphragm not seen. Left lung full of a distinct diffuse mottling; diaphragm not clearly seen.

Post-mortem Examination.—Right lung: Throughout the whole lung are large saccular cavities, varying in size from a large walnut to a large hen's egg. Lung-tissue extremely fibrotic throughout, marked adherence of the pleura.

PLATE IV.

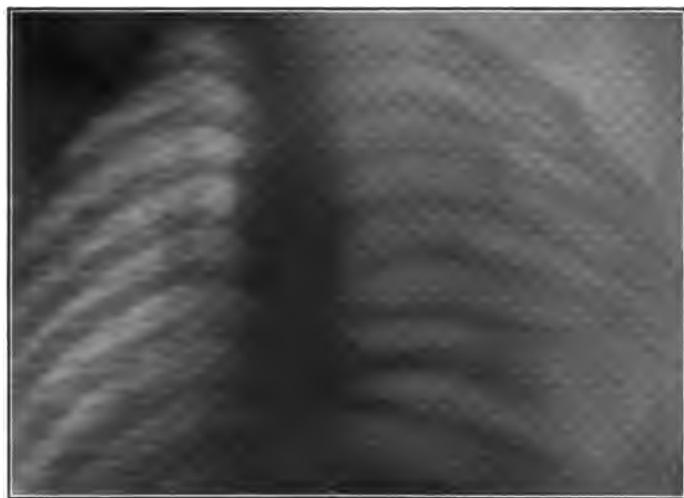


Fig. 3. Case 7 : A. S. F.



Fig. 6. Case 10 : C. C.



Left lung : Throughout whole lung was a diffuse racemose tubercular affection. No bronchiectasis ; pleura generally adherent.

Case 8.—F. L., æt. 21 years. *Diagnosis* : Bronchiectasis of left lung (? also right lung). The sputum contained no tubercle-bacilli ; its smell was offensive.

Physical Signs.—The right lung, anteriorly, is free. Posteriorly, from the fifth dorsal vertebra to the base, the percussion-note was dull, with a few medium râles.

Over the left lung, anteriorly, from just below clavicle to the base, the percussion-note was dull, with numerous coarse squeaking râles. The breathing was tubular ; vocal resonance was increased, and whispering pectoriloquy present. Posteriorly, from the second dorsal vertebra to the base, the percussion-note was dull, and breathing was tubular ; there were numerous coarse squeaking râles ; vocal resonance was increased ; and whispering pectoriloquy present.

X-ray Appearances.—The left lung showed numerous streaks throughout with opacity. Dark masses were seen in both larger bronchi ; action of the diaphragm on the left side was impaired.

Post-mortem Examination.—The left lung throughout exhibited very marked cylindrical bronchiectasis. The lung-tissue was very fibrotic. The dilated bronchial tubes were much thickened. The right lung showed some slight bronchopneumonia in its lower lobe ; otherwise it was spongy and oedematous.

Case 9.—A. E., æt. 3½ years. *Diagnosis* : Bronchiectasis. The sputum contained no tubercle-bacilli ; its smell was very offensive.

Physical Signs.—The right lung, anteriorly, from the fourth rib to the base, was very dull on percussion. Breath-sounds were weak, and there were a few medium râles. Posteriorly, from the fourth dorsal vertebra to the base, the breath-sounds were weak, with many medium râles.

Over the left lung, anteriorly, from just below the clavicle to the base, the percussion-note was dull. From the third intercostal space to the base there was tubular breathing ; coarse metallic and medium râles ; vocal resonance was increased, and whispering pectoriloquy present. Posteriorly,

from the apex to base, the percussion-note was dull. From the third dorsal vertebra there was tubular breathing, coarse metallic and medium râles, vocal resonance was increased, and whispering pectoriloquy present.

X-ray Appearances.—The lower two-thirds of the left lung was filled with branching opacities. The right lung showed at the base numerous branching opacities; the apex seemed normal.

Case 10.—C. C., æt. 12 years. *Diagnosis:* Bronchiectasis. The sputum contained no tubercle-bacilli; smell offensive. (Figs. 4, 5, 6.)

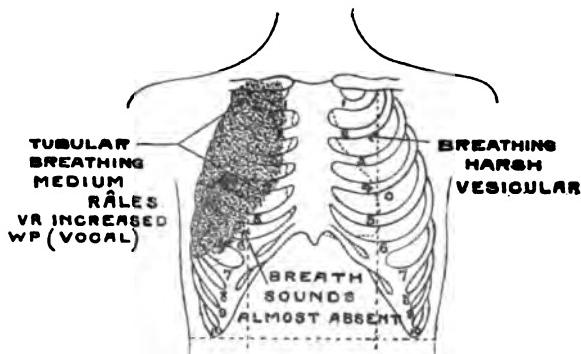


Fig. 4.

Note.—In this case "complete arrest" of the disease occurred under creosote vapour-baths.

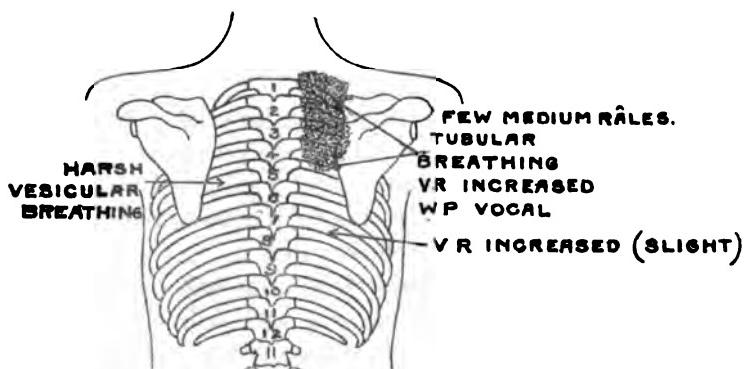


Fig. 5.

X-ray Appearances.—Middle part of right lung obscure; diaphragm acts fairly well.

Case 11.—D. F., æt. 17 years. *Diagnosis:* Bronchiectasis: quiescent tuberculosis in left upper lobe. The sputum contained no tubercle-bacilli even on repeated examination (12 times); its smell was offensive.

Physical Signs.—Over the right lung, anteriorly, from the fourth rib to the base, the percussion-note was dull, with tubular breathing and some coarse and medium râles: vocal resonance was increased, and whispering pectoriloquy present. Posteriorly, from the fourth dorsal vertebra to the base, the percussion-note was dull, with tubular breathing and many coarse and medium râles; vocal resonance was increased, and whispering pectoriloquy present. The left lung was free.

X-ray Appearances.—The right lung over its upper part was somewhat opaque. In both lungs, external to the heart striæ were seen. No cavity was apparent; there was slight impairment in the movement of the diaphragm (both sides).

Case 12.—C. L., æt. 23 years. *Diagnosis:* Bronchiectasis. The sputum contained no tubercle-bacilli; its smell was offensive.

Physical Signs.—Over the right lung, anteriorly, from just below the clavicle to the base, the percussion-note was absolutely dull, with tubular breathing, and numerous coarse bubbling râles; vocal resonance was increased, and whispering pectoriloquy present. At the base, the breath-sounds were almost absent. Posteriorly, from the second dorsal vertebra to the base, the percussion-note was absolutely dull, with numerous coarse bubbling râles. Vocal resonance was increased, and whispering pectoriloquy present. The left lung was free.

X-ray Appearances.—The right lung showed some degree of opacity all over: movement of the diaphragm was much impaired. The left lung was normal, and the action of diaphragm on this side was not impaired.

Case 13.—M. H. *Diagnosis:* Bronchiectasis of both lungs. The sputum contained no tubercle-bacilli; smell offensive. (Figs. 7, 8, 9.)

X-ray Appearances.—View obscured all over left lung. Diaphragm not clearly seen. Numerous striæ seen all over both lungs.

Case 14.—A. W., age 26 years. Diagnosis: Bronchiectasis left lung. The sputum contained no tubercle-bacilli; its smell was offensive.

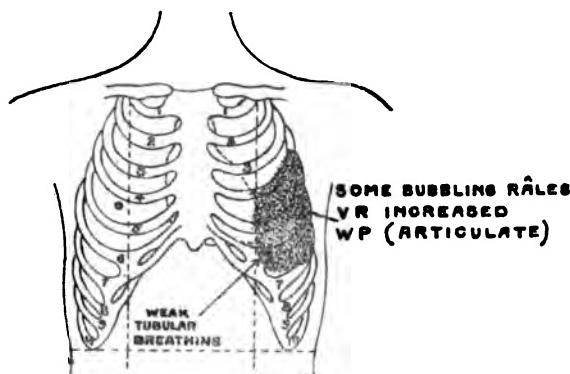


Fig. 7.

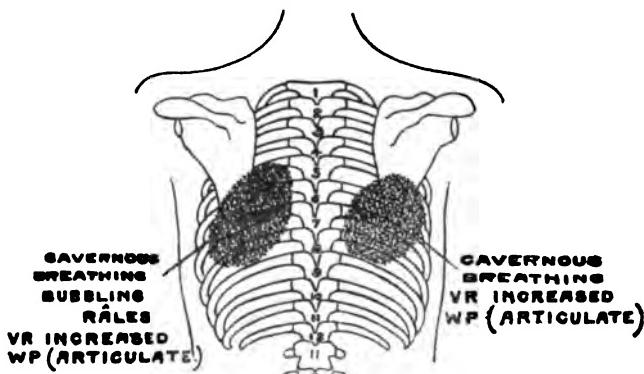


Fig. 8.

Physical Signs.—The right lung was free; the left lung anteriorly was free. Posteriorly, from the fifth dorsal vertebra to the base, the percussion-note was dull, there was weak amphoric breathing, with numerous medium râles and a few coarse bubbling râles. Vocal resonance was increased, and whispering pectoriloquy present.

X-ray Appearances.—The left lung at the apex was somewhat opaque. From the spine of the scapula to the base the ribs are only just discernible.

PLATE V.

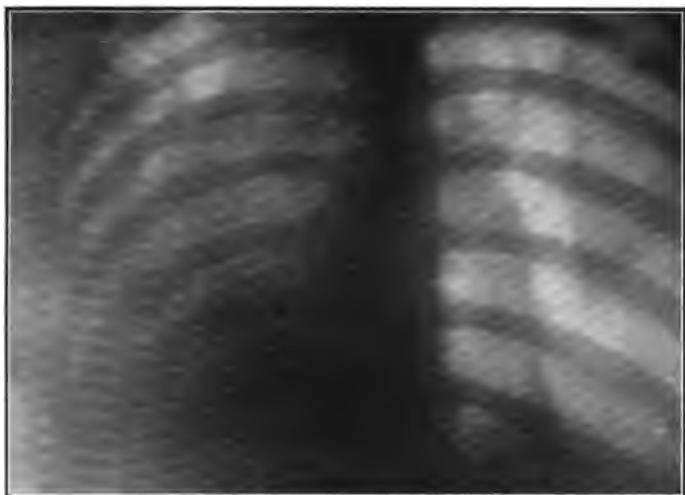


Fig. 9. Case 13 : M. H.



Fig. 12. Case 16 : J. E.

PLATE VI.



Fig. 15. Case 19 : J. B.

Case 15.—A. M., æt. 8½ years. *Diagnosis:* Bronchiectasis of right middle lobe and base of left lower lobe. Sputum, no tubercle-bacilli; smell offensive.

Physical Signs.—Over the right lung, anteriorly, from the fourth rib to the base, the percussion-note was dull, with many medium râles; vocal resonance was increased. At the base the breath-sounds were very feeble. Posteriorly, a few medium râles were heard around inferior scapular angle.

Over the left lung, anteriorly, from the fourth rib to the base, the percussion-note was dull, with cavernous breathing. A few metallic râles were audible, and vocal resonance was increased. Posteriorly, around the inferior scapular angle and towards the base, the breath-sounds were very harsh, with croaking râles.

X-ray Appearances.—In the left lung, at the base, was a small cavity. In the right lung, some shadows were seen in the upper part.

The action of the diaphragm was impaired on both sides.

Case 16.—J. E., æt. 25 years. *Diagnosis:* Chronic bronchitis; emphysema; bronchiectasis. The sputum contained no tubercle-bacilli; smell offensive. (Figs. 10, 11, 12.)

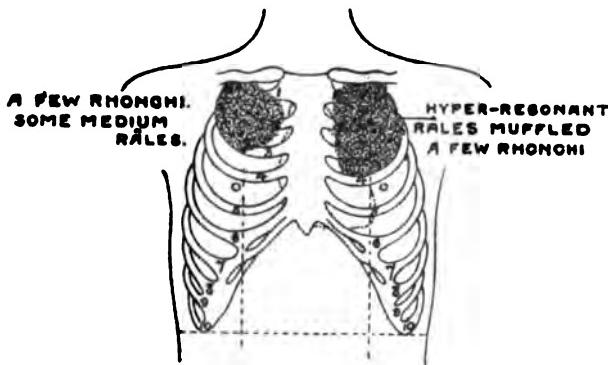


Fig. 10.

X-ray Appearances.—Left lung, apex obscure; right lung, apex obscure. Considerable opacity throughout the whole lung.

Case 17.—A. S., æt. 36 years. *Diagnosis*: Chronic pulmonary tuberculosis. (?) Bronchiectasis, right lower lobe. The sputum contained tubercle-bacilli, and its smell was offensive.

The patient's illness began with double pneumonia (lobar).

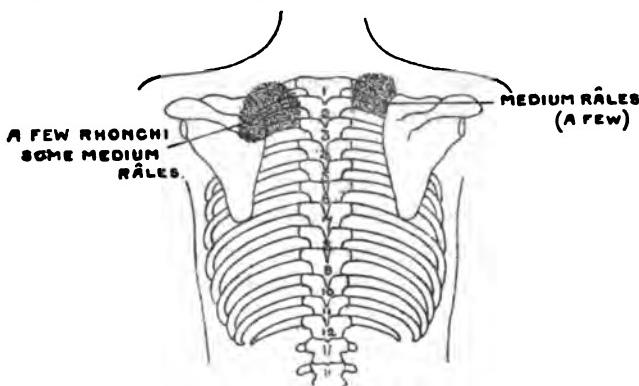


Fig. 11.

Physical Signs.—Over the right lung, anteriorly, from just below the clavicle to the base, the percussion-note was dull. Breathing was bronchial, and there were numerous medium râles. Posteriorly, from the fifth dorsal vertebra to the base, the percussion-note was dull. Breathing was tubular, with numerous medium and some coarse bubbling râles. Vocal resonance was increased, and whispering pectoriloquy present.

Over the left lung, anteriorly, in the second, third, and fourth intercostal spaces near the sternum are some fine râles. Posteriorly, this lung is free.

X-ray Appearances.—The root of the left lung is opaque, and the action of diaphragm is slightly impaired. On the posterior aspect of the right lung the base of the lower lobe is opaque and the diaphragm is fixed.

Case 18.—L. S., æt. 7½ years. *Diagnosis*: Bronchiectasis, chronic pneumonia. The sputum contained no tubercle-bacilli ; the smell was very offensive.

Physical Signs.—Over the right lung, anteriorly, from the third rib to the base, the percussion-note was very dull, with tubular breathing. There were many bubbling coarse râles and some medium râles ; vocal resonance was increased, and whispering pectoriloquy present. Posteriorly, from the fifth

dorsal vertebra to the base, the percussion-note was very dull, with tubular breathing; many coarse bubbling râles and some medium râles were audible. Vocal resonance was increased, and whispering pectoriloquy was present. The left lung was free.

X-ray Appearances.—The right lung showed some opacity throughout, but this was especially marked over the lower lobe. The heart was considerably displaced to the right side.

Case 19.—J. B., æt. $5\frac{1}{2}$ years. *Diagnosis:* (?) Early bronchiectasis, right lower lobe. Sputum, no tubercle-bacilli; smell very offensive.

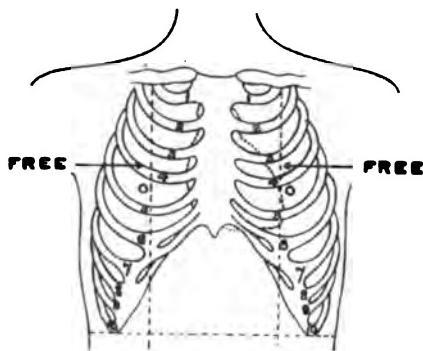


Fig. 13.

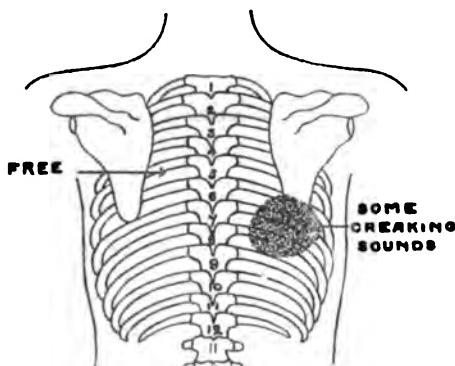


Fig. 14.

X-ray Appearances.—Right lung, slight opacity at the base. Action of diaphragm somewhat impaired.

Case 20.—G. D., æt. 6½ years. *Diagnosis:* Bronchiectasis of left lower lobe and right lower lobe.

Physical Signs.—The right lung, anteriorly, is free. Posteriorly, just around the inferior scapular angle, the percussion-note is somewhat dull, with a few fine râles.

Over the left lung, anteriorly, from the fourth rib to the base, the percussion-note is dull : tubular breathing, with some creaking râles and many medium râles, are audible ; vocal resonance increased, and whispering pectoriloquy present. Posteriorly, from the fourth dorsal vertebra to the base, the percussion-note is dull, with tubular breathing and many creaking and medium râles ; vocal resonance increased, and whispering pectoriloquy present.

X-ray Appearances.—The lower part of the left lung is distinctly opaque. The diaphragm is obscured. In the right lung nothing abnormal is seen.





PLATE VII.



Fig. 1. *Showing the posterior wall of the stomach projecting through the rent in the transverse mesocolon.*



Fig. 2. *Showing the oblique application of the clamp to the stomach.*

A SIMPLE METHOD OF PERFORMING
GASTRO-ENTEROSTOMY AND OTHER ABDOMINAL
ANASTOMOSES.

By B. G. A. MOYNIHAN, M.S., F.R.C.S.,
Assistant Surgeon to the Leeds General Infirmary.

[With Plate VII.]

THE operation of gastro-enterostomy is performed in the following manner :—

The abdomen is opened about three-quarters of an inch to the right of the middle line, and the fibres of the rectus are split. After the peritoneum is opened, the great omentum and transverse colon are lifted out of the abdomen and turned upwards over the epigastrium. The under surface of the transverse mesocolon is exposed, and the vascular arch, formed mainly by the middle colic artery, is seen. A bloodless spot is chosen, a small incision made in the mesocolon, and the finger passed into the lesser sac. The opening in the mesocolon is then gradually enlarged by stretching and tearing, until the fingers can be passed through it (Fig. 1). It is very rarely necessary to ligature any vessel. The hand of an assistant now makes the posterior surface of the stomach present at this opening, and the surgeon grasps the stomach and pulls it well through. A fold of the stomach, about three inches in length, is now seized with a clamp (made for me by Down Brothers, London, a modification of Doyen's clamp), whose blades are sheathed in rubber tubing. The clamp is applied in such a way that the portion of the stomach embraced by it extends from the greater curvature obliquely upwards to the lesser curvature and towards the cardia (Fig. 2). It is important that the point on the greater curvature held by the clamp should be the lowest point. This is made certain before the stomach is turned over to reach its posterior surface, by observing that point which lies lowest in the abdomen. When the posterior surface is exposed, special care is taken that this lowest point is fixed in the end of the clamp. The duodenal-jejunal angle is now sought, and readily found by sweeping the finger along the under surface of the root of the transverse mesocolon to the left of the spine. The jejunum is then brought to the surface, and a portion of it, about seven or

eight inches from the angle, is fixed in a second pair of clamps. The two clamps now lie side by side on the abdominal wall (Fig. 3), and the portions of stomach and jejunum to be anastomosed are well outside the abdomen, embraced by the clamps. The stomach, with the exception of the part embraced by the clamp, is returned to the abdomen through the upper part of the incision. The whole operation-area is now covered with gauze wrung out of hot sterile salt-solution, the clamps, with the stomach and jejunum which they embrace, alone being visible outside the abdomen. A continuous suture is then introduced, uniting the serous and subserous coats of the stomach and jejunum (Fig. 3). The stitch is commenced at

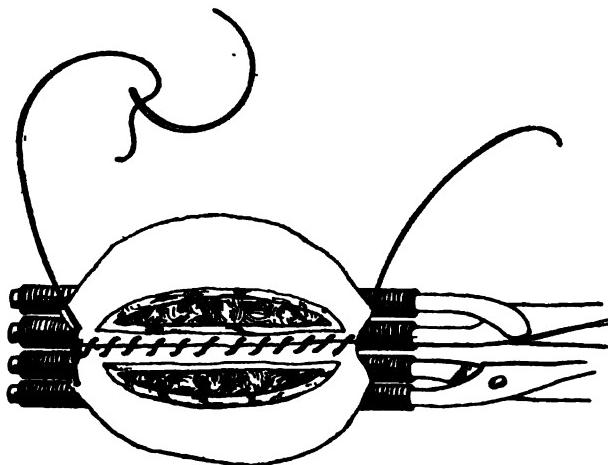


Fig. 3. Clamps side by side; the first line of suture.

the left end of the portions of gut enclosed in the clamp, and ends at the right. The length of the sutured line should be at least two inches; its average length is two and three-quarters or three inches.

In front of this line an incision is now made into the stomach and jejunum, the serous and muscular layers of each being carefully divided until the mucous membrane is reached. As the cut is made, the serous coat retracts and the mucous layer pouts into the incision. The cut edge of the serous coat is loosened all round from the underlying mucosa. An ellipse of the mucous membrane is now excised from both stomach and jejunum, the portion removed being about one and three-quarter or two inches in length, and rather more than half an inch in

breadth at the centre. The gastric mucosa shows a marked tendency to retract ; it is therefore seized with a pair of miniature (French) vulsella on each side. No vessels are ligatured as a rule. The cut surface of the bowel and stomach may occasionally ooze slightly ; this can be checked at once by tightening the clamps one notch. The inner suture is now introduced (Fig. 4). It embraces all the coats of the stomach

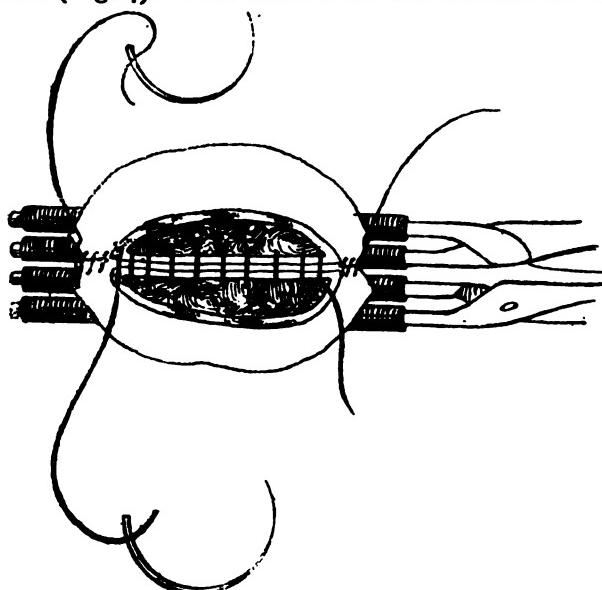


Fig. 4. The stomach and jejunum opened ; the inner, haemostatic suture.

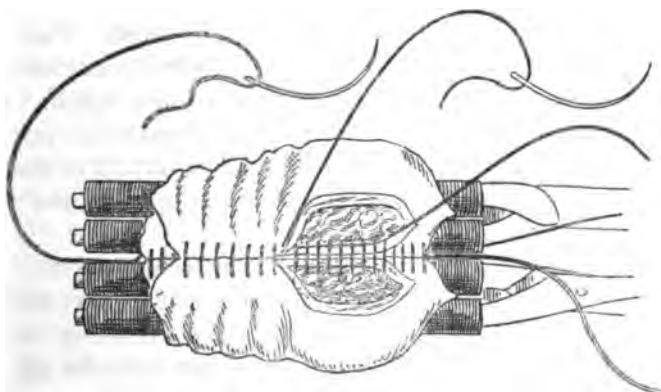


Fig. 5. Inner suture complete.

and jejunum, and the individual stitches are placed close together and drawn fairly tight, so as to constrict all vessels in the cut edges. The suture begins at the same point as the outer one, and is continued without interruption all round the incision to the starting point, where the ends are tied and cut short (Fig. 5). It will be found that there is no need to interrupt the stitch at any point, for there is no tendency on the part of the sutured edges to pucker when the stitch is drawn tight. The clamps are now removed from both the stomach and the jejunum, in order to see if any bleeding point is made manifest. Very rarely—about once in ten cases—a separate stitch at a bleeding point is necessary. The outer suture is now resumed, and continued round to its starting-point (Fig. 6), being taken through the serous coat about one-

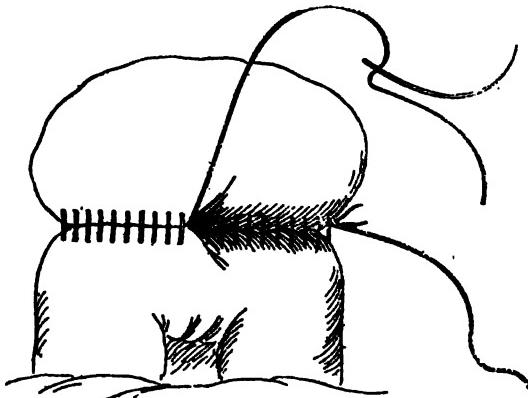


Fig. 6. Clamps removed ; completion of outer suture.

sixth of an inch in front of the inner suture. This outer stitch is also continuous throughout; when completed the ends are tied and cut short, as with the inner stitch. There are thus two suture-lines surrounding the anastomotic opening; an inner, haemostatic, which includes all the layers of the gut; and an outer, approximating, which takes up only the serous and subserous coats.

For both stitches I use thin Pagenstecher thread. The needle used is of a special pattern, being rather more than half a circle and having a slot-eye for easy threading. (These needles, which are the best that I have ever used for all intestinal work, are made by Down Brothers of London.) In introducing the stitches it will be found a great advantage to

draw lightly upon the thread between the needle and the last stitch. A little ridge is thus raised up both in the stomach and in the intestine, and into these ridges the needle passes quite readily. There is then no need to dip down, as it were, to pick up the gut on the point of the needle. No sutures are passed through the mesocolon and stomach. The gut is lightly wiped over with a swab, wet in sterile salt-solution ; the stomach and omentum are lifted out of the upper part of the wound, and replaced within the abdomen in their normal positions.

Other intestinal anastomoses are carried out in an exactly similar manner. The portions of gut to be united are lifted outside the abdomen and clamped ; the clamps are approximated ; all the bowel, save that embraced by the clamps, is returned within the abdomen, the operation-area is surrounded by swabs or gauze wrung out of hot sterile salt-solution, and the stitching is begun. The length of the opening made can be varied at the will of the operator.

If Roux's method of gastro-enterostomy be performed, a longer loop of jejunum is placed in the clamp. The proximal part of the jejunum is now divided about one inch and a half from the clamp, the distal limb then anastomosed to the stomach, clamped as in the ordinary operation of gastro-enterostomy, and the proximal limb united to the side of the distal. The suturing of the intestine is all carried out upon the long loop, as it lies with its ends gripped by the clamp.

An end-to-end anastomosis, also, is readily performed in this manner. The clamps grip the opposing ends, and include a portion of the mesentery ; they are applied obliquely, the tips of the blades being closer together than the handles. Precisely the same suturing is adopted. The serous coats, about a sixth or an eighth of an inch away from their cut ends, are united round one half of their circumference. The excess of the mucous coat which protrudes from both cut ends is now or at an earlier stage trimmed away, and a continuous suture passed to include all the coats or only the mucous coat close to their severed ends. The suture passes completely round the gut without any change or interruption. After it is cut short, the original serous suture is completed. Especial care must be taken at the mesenteric edge, and here an additional one or two interrupted sutures may be necessary.

A REVIEW OF THE RECENT LITERATURE ON HERNIA.

By ALBERT CARLESS, M.S., F.R.C.S.,

Surgeon to King's College Hospital; and Professor of Surgery in King's College, London.

ALTHOUGH it might seem almost impracticable to write anything new on the subject of Hernia at the present day, yet a considerable amount of useful material has been contributed to the various medical journals within the last few years, of which certain points seem worthy of comment.

TREATMENT OF RECENT HERNIAS AND OF HERNIAL PREDISPOSITION.

Professor Clark Stewart, of Minnesota,¹ opens an article on the treatment of recent hernias by the remark: "Has not the time come when all adults having recent hernias should be advised to submit to the radical operation as soon as their condition is diagnosed?" He rightly points out that annoyance and discomfort arise from wearing a truss; that none but children are ever cured by such means; and that in older subjects the only good derived is by diminishing the risks of the condition; whilst, on the other hand, some harm follows owing to the constant presence of the truss producing pressure-atrophy of the underlying parts. That operative treatment is not usually advised by the rank and file of the profession is evident from the success of the "great number of irregulars who live by exploiting various hernia cures." The public have been more or less educated to recognise the value of operation for the relief of appendicitis and gall-stones; why should not a similar process of education lead them to recognise that the only *cure* for hernia is by operative measures? With this idea the present writer fully concurs. For years he has been in the habit of teaching that all inguinal hernias should be operated on, except those unusual cases where special contra-indications exist; and he has taught the contra-indications to operation rather than the indications. One result of this has been that numbers of cases have been dealt with in which it would have been impossible to find

¹ *St. Paul's Med. Journ.*, October, 1903.

the sac without slitting up the external abdominal ring ; and in consequence of this, the writer has been impressed with the number of cases in which there was, in addition to the sac, a very marked protrusion of the subperitoneal fat requiring removal. The abdominal parietes have been usually well developed in these early cases, and the operation for cure has been much more consistently successful than formerly. Moreover, in a considerable number of cases, one has operated for a weak and bulging groin in young people, where no absolute hernial protrusion could be said to exist, but in most of whom there was found a small flask-shaped protrusion of the peritoneum, the opening up of which only required a little extra abdominal pressure as a result of some unusual exertion.

The existence and characters of this "hernial predisposition" formed the subject of portion of a lecture given by Professor Sultan¹ of Göttingen. He pointed out that there are two underlying anatomical features present :—(1) The existence of a small peritoneal sac, which extends down from the internal ring for a variable distance towards the testis, and which remains hidden, with its surfaces in contact, until it is forcibly opened up by the protrusion of some viscus. That such a condition is in the first place more often congenital than acquired, seems likely, as it is difficult to imagine that these small flask-shaped protrusions which are so often seen in these early cases could well be developed by pressure from within. Let the existence of the congenital flask-shaped pouch, due to the non-obliteration of the upper end of the funicular process, be granted, and an explanation of the rest of the phenomena is not difficult. (2) A weak and poorly-developed inguinal canal is the second condition underlying a predisposition to hernia. The size of the external ring, whether large or small, is no criterion as to the strength of the canal ; but its weakness is demonstrated by making the patient use his abdominal muscles, when an oval swelling at the upper end of the canal will appear. Should the swelling persist after the abdominal pressure has been relaxed, or should it require to be replaced by the hand, then a true hernia has developed. Should the swelling disappear, however, as soon as the intra-abdominal pressure is relaxed, then only a hernial predisposition is present. This

distinction between the two conditions has been drawn by Kocher, and may be admitted as useful.

The question of operation for such conditions is then discussed by Sultan, who deals with the dangers of the operative treatment and the degree of security that may be afforded. He quotes statistics to prove that the mortality of operation for hernia is about 0·48 per cent. These figures are calculated from 7,419 cases reported between 1895 and 1902. Most of the deaths occurred from pulmonary complications in old people, and therefore need scarcely be taken into consideration in discussing this question as it affects young subjects. Coley of New York has recently published his results in 1,075 cases of operation on 911 patients with two deaths, one due to ether-pneumonia, and one to intestinal obstruction.¹

As to the question of relapses, there is a greater divergence in the published statistics, and this is especially noticeable in reference to the age of the patients. Coley's figures, based on 917 cases in which Bassini's operation was performed, give slightly more than one per cent. of relapses; but then nearly two-thirds of his patients were young people under the age of 20, no fewer than 538 being children between the ages of 4 and 14. Other surgeons, dealing probably with a greater proportion of adult or elderly patients, do not record such satisfactory results; but relapses usually average under 10 per cent. There can be no question that, in young adults, the sooner the operation is undertaken after the appearance of the hernia, the better the prognosis.

Coley's latest investigations as to relapses² fully confirm his previous conclusions. He found that of 139 fresh cases of relapse investigated, 65 per cent. relapsed within six months of the operation; 80 per cent. within the first year after the operation; 13½ per cent. of the relapses occurred between the first and second years, and only 6½ per cent. after two years, so that his opinion still holds good, that if a patient operated on for hernia remains sound for a year, there is very little likelihood of a relapse after that date.

As to the technique employed by Coley, Bassini's method is mainly followed, but there are slight differences in detail. Thus, he always introduces a stitch above the cord, where the

¹ *Annals of Surgery*, June, 1903.

² *Op. cit.*

abdominal wall is frequently very weak ; and the writer of this article fully confirms the necessity for this proceeding. Then Coley has given up the use of silk, and employs kangaroo-tendon of different thicknesses for the deep stitches and for closing the wound in the external oblique muscle, whilst catgut is used for the skin. The kangaroo-tendon is chromicised just sufficiently to remain unabsorbed for about four weeks, and is then sterilised by the cumol-method and preserved in absolute alcohol. He lays great stress on rapid and clean dissection, so as to avoid bruising of the tissues and infiltration with blood ; he has also found that the use of rubber gloves for his assistants and of gloves or cots for himself has reduced the number of cases of suppuration from 4·2 to 1·25 per cent.

TRAUMATISM AS A CAUSE OF HERNIA.

The influence of traumatism in the production of hernia is of importance and interest in view of present-day legislation concerning the liability of employers. Two varieties of traumatic hernia may be described, viz., those which occur in the ordinary hernial regions and those which develop elsewhere. In the latter class the median line is by no means an uncommon site for the formation of a traumatic hernia, which usually develops above or in the neighbourhood of the umbilicus. Little difficulty is experienced in determining the rôle played by the alleged accident in such a case ; but when the hernia is situated in the neighbourhood of the inguinal region, it is not always easy to distinguish it from an ordinary rupture. A case in point is related by Guermonprez of Lille,¹ in which a rupture formed in the right inguinal region of a painter, as the outcome of a direct blow. When the man stood up, the appearance of an interstitial inguinal hernia presented itself ; but on his lying down, it disappeared, and even on coughing, in that attitude, did not reappear. A recent bruise could be detected in that region, and there was a slight skin-abrasion. On careful digital examination it was possible to make out that the hernial aperture, which was somewhat tender, was not identical with the inguinal canal ; a bridge of fibrous tissue, about 12 mm. in thickness, extended between the two. The man was kept in the recumbent posture, and a supporting bandage and dressing

¹ *Gazette des Hôpitaux*, July 21, 1903.

applied ; and in about a fortnight all trace of the hernia had disappeared, and the lesion in the abdominal wall had closed up.

Quite distinct from such cases are those in which a working man claims to have ruptured himself in the course of his work as the result of an accident, and this condition is discussed fully by Sultan.¹ He points out that it is important to make sure that a correct diagnosis has been arrived at, as Haegler quotes statistics from an accident-insurance society to prove that 15 per cent. of people claiming to have been ruptured as the result of an accident were not suffering from rupture at all, but were the subjects of hydrocele, varicocele, epididymitis, and similar conditions. That such a traumatic hernia is not very common is indicated by the figures of the Göttingen clinique, in which out of 3,000 accidents dealt with in ten years, only 325 hernias could be found ; and even of these, the dependence on traumatism could only with certainty be ascertained in three cases. Of course Sultan is here only discussing cases with an acute onset, and is not dealing with those hernias which are gradually developed in persons who have previously been the subjects of weak groins with a hernial tendency. He will only admit the title of traumatic hernia in cases (*a*) where there is definite evidence of the occurrence of a sudden effort which would raise the intra-abdominal pressure ; (*b*) where it is certain that no hernia existed beforehand ; (*c*) if the onset of the trouble was associated with pain so great that the patient had to leave work, and where examination by a surgeon elicited tenderness and pain. He admits that the tearing and opening up of the inguinal canal does not usually result in swelling or effusion of blood, and points out that a weak hernial aperture elsewhere is rather to be looked on as evidence of a previous hernial predisposition and against the diagnosis of traumatic hernia.

POST-OPERATIVE VENTRAL HERNIA.

The prevention of post-operative ventral hernia has called forth several communications, and amongst them may be noted those by Hahn² and Winslow Anderson³ of San Francisco. Somewhat similar suggestions emanate from each. Importance is laid on the suturing of the abdominal wall layer by layer

¹ *Op. cit.*

² *Centralbl. für Chirurgie*, January 24, 1903.

³ *Pacific Med. Journ.*, October, 1903.

rather than by taking in the whole thickness in one suture ; and both authors rightly insist that fasciæ and aponeuroses are more resistant than muscle-fibres, and therefore should be included, whilst the muscular tissue may be left aside. As to the advisability of this, one is very doubtful, and possibly the adoption of this rule may explain why Anderson states that lateral incisions are more likely to bulge than median. The importance of securing fasciæ and aponeuroses cannot be questioned ; but if, in addition, a good hold of divided muscle-planes is also secured, there is not much likelihood of a subsequent hernia if the wound heals *per primam*. Hahn advises thoroughly-sterilised catgut, or silkworm gut, which may heal into the tissues and remain as an integral element in them. Then, too, the patients must be kept in the recumbent posture for a suitable period of time, not less than three weeks, and the abdomen should be supported by bandage or belt for three months.

In spite of these or similar precautions, ventral herniæ are only too commonly seen, especially when suppurating foci have to be drained, as after acute appendicular abscesses ; whilst they are also produced by operations which involve removal of portions of the abdominal wall. To deal with such lesions is a matter of considerable difficulty, since there is often an insufficient amount of tissue to draw together over the gap. Witzel was probably the first to suggest that a means of obviating this difficulty lay in embedding a filigree or network of silver cross-wires in the tissues, and this plan has been followed with success in a number of cases. Willard Bartlett¹ of St. Louis contributes a paper giving his experiences, and relates seven cases, with good results in six. He points out, as the basis of his plan of operating, that scars in the abdominal wall usually spread laterally and not longitudinally to any great extent ; and, therefore, it is needless to strengthen the scar with a great number of needless wires which run parallel to the axis of the incision, and which, besides being of no avail, serve by their presence to stiffen the abdominal wall, and thus prevent its perfect mobility. His filigree, therefore, consists merely of a suitable number of transverse loops, held together by a longitudinal bar in the centre. The loops must be of sufficient length to reach across the gap, and extend an inch or

¹ *Annals of Surgery*, July 19, 1903.

two into the tissue-layers, where they will be subsequently anchored, not by sutures, but by newly-formed scar-tissue which naturally fills out the opening of each loop, whilst the patient is in bed after the operation. By this means no irritating sharp ends are embedded in the parts, and each loop is distinct from its neighbour. The longitudinal strand in the centre corresponds with the length of the incision, and is essential in order to prevent the loops from being forced apart by a hernial protrusion between them. The wire-netting must of course be made to suit each particular case, but this is easily accomplished on a board, with nails driven in at suitable intervals, the wire being wound around them. Anderson suggests that it is useless waste of time to suture the ends of the loops to the tissues; all he has done is to fix by sutures the longitudinal centre-bar, so that it cannot slip.

As an illustration of the value of this method may be mentioned his first case, which occurred in a child three and a half years of age. A large segment of the abdominal wall was removed for a sarcomatous tumour, the gap extending from the rectus abdominis muscle in front to the vertebral column behind, whilst the last costal cartilage and a portion of the iliac crest were included in the tissues removed. A suitable filigree was carefully stitched in over the subperitoneal tissue, and in this instance a network of cross-wires was selected rather than the appliance suggested above. The skin was placed down over this, and the wound thereby closed. The child recovered, and at the end of three weeks was allowed to get up and run about. There was no sign of the filigree and no appearance at any time of a hernial protrusion. Unfortunately the sarcoma recurred, and the child died three and a half months after the first operation. The wires were found *post mortem* to be evenly scattered through the new masses of sarcomatous tissue. Such a case is extremely satisfactory from the purely mechanical point of view, and this plan of treatment may be well employed in a considerable number of cases which readily suggest themselves.

GANGRENOUS HERNIA.

A useful contribution to the study of Gangrene in Strangulated Hernia is contributed by E. M. Corner,¹ based on 559 cases

¹ *St. Thomas's Hospital Reports*, Vol. XXIX., 1902.

admitted to St. Thomas's Hospital during the years 1891-1900. Of these 479 were operated on, and in 68 cases gangrene of the bowel occurred, *i.e.*, in 14·2 per cent. It is interesting to note that, whilst only 6·1 per cent. of the inguinal hernias were gangrenous, 19·5 per cent. of the femoral type were in this condition, and 25·4 of the umbilical, and this in spite of the fact that the actual number of inguinal exceeded that of the femoral by 14 (219 inguinal to 205 femoral). As to the actual cause of the gangrene, Corner emphasises the fact that, whilst the direct pressure of the constricting agent and the cessation of the circulation are important factors, yet there is another element which has been much underrated or even overlooked in the past, *viz.*, the invasion of the intestinal coats by bacteria, leading to an infective necrosis. Illustrations are given of acute inflammation in the sac and in the peritoneal cavity apart from necrosis, indicating that bacterial invasion from within the intestine is an important possibility. Again in some cases a coil of bowel was returned to the abdomen, looking smooth, shiny, and healthy ; yet when the patient died, four days later, the whole coil was found gangrenous at the autopsy. Still another point is of interest, *viz.*, that the gangrene extends beyond the limits of the strangled gut, obviously by microbic invasion of the contiguous tissues, and this invasion is always more marked above than below the area of constriction ; the presence of poisonous contents above the constriction will explain this tendency. The importance of such an observation is that, if resection is undertaken in these cases, it must be done with a free hand, so as to get beyond the limits of such invasion.

As regards the symptomatology of gangrenous hernia, it must be remembered that necrosis may follow very rapidly. Of the cases reported, gangrene was found in two to have occurred within one day ; between the first and second days in 11 cases, and in 13 cases between the second and third days. The acuteness of the strangulation will determine the rapidity of the necrotic process. Gangrene is more commonly present in small herniæ of recent origin, especially those strangulated on their first appearance. The symptoms in these cases may be very slight, and the classical phenomena described in text-books are only seen in the later stages. An absence of fluid in the

sac in many cases is correctly noted, and emphysematous crackling is only observed as a late sign.

The results of treatment were extremely unsatisfactory, as they must always be under these circumstances. Twenty-seven cases were treated by the establishment of an artificial anus, and of these there was a mortality of 88·9 per cent. Fifteen cases were dealt with by resection and subsequent anastomosis, and the mortality of this group was 80 per cent., so that there was but little to choose between the two classes. One cannot but believe that an insistence on early operation, without recourse to that dangerous proceeding, taxis, or after, at most, a perfunctory attempt at the same, followed by immediate and extensive resection if gangrene is present or obviously imminent, will give better results than these in the future.

TAXIS.

Not a little attention has been directed of late to the subject of taxis, and although one cannot go quite so far as Lanz,¹ who entitles an article on this matter "Away with Taxis," yet there can be no question that it is used both injudiciously and in many cases where it can obviously do no good. Haberer² relates three instances in which forcible taxis was responsible for grave mischief. In one instance a right inguinal hernia had been strangled for two days in a boy, four and a half years old. The local practitioner sought to replace it by taxis, and then, after an apparent failure, advised waiting for another twenty-four hours in order to make another attempt; but as the child was rapidly getting worse, the mother took it to hospital. There had been no action or passage of flatus from the commencement of the illness. On operation, as soon as the sac was opened, there was an escape of blood and blood-stained fluid, but no other contents were found. The intestine had evidently been reduced. The incision was carried up into the abdomen, and in the midst of a focus of peritonitic inflammation was found the lowest coil of the ileum, gangrenous and adherent to the cæcum. The coil was drawn out, and the inflamed area shut off from the general cavity of the peritoneum by gauze drains. An artificial anus formed, but the patient died of collapse on the tenth day. Obviously the gut

¹ *Münchener Med. Wochens.*, 1902, No. 5.

² *Wiener klin. Wochenschr.*, 1903, No. 49.

had been pushed back into the abdomen in a condition of gangrene, and diffuse peritonitis followed. In the second case, a child of two and a half years had suffered from a strangulated right inguinal hernia for three days ; the result of taxis was to tear the mesentery of the strangled gut, and the sac was full of blood. The cæcum was also present in the sac, along with a long appendix which was removed ; it sufficed, however, to secure the bleeding points, close the rent in the mesentery, and perform a radical operation on the hernia. The child required sundry salt-and-water injections, but did well.

In the third case the patient was a woman of 41 years, with a left crural hernia which had been strangulated for six hours. Taxis led to tearing of the mesentery, and this necessitated removal of 83 cm. of the small intestine. The patient did well.

As other examples of the harm that may be done, Hilgenreiner refers to cases damaged through taxis in Wölfler's clinique in Prague ; eight suffered from reposition *en masse*, one had a torn sac, and one a contused testicle. Lanz observed four cases in one year, of which one was a reduction *en masse*, and three had sustained a reduction of gangrenous intestine—all of which cases proved fatal. Statements such as these are mere solitary illustrations of the injury which may be done by unwisely-directed taxis. That it should occupy a place in the treatment of strangulated hernia cannot be denied, but its place should be carefully defined. The facts mentioned in the St. Thomas's report alluded to above are important in this connection. In all cases where there is likely to be an acute strangulation, taxis should be very sparingly employed. Thus in small herniæ, which are very painful and associated with grave symptoms, especially if they have been but recently developed, or if strangulation follows their first appearance, taxis should be but little used ; naturally this will apply to femoral more than to inguinal herniæ. Again, when the hernia has been strangulated for some time, gangrene is more likely to have developed, and taxis is therefore contra-indicated. The cases in which it may be employed with most advantage are those where the hernia is of some size, particularly when inguinal, when the symptoms are not very severe, and especially if taxis has been successful on former occasions.

OPERATIVE TREATMENT OF FEMORAL HERNIA.

The operative treatment of femoral hernia is not a matter of difficulty in the simpler cases ; removal of the sac and closure of the femoral canal by a simple or a purse-string suture will suffice as a rule. But in bad cases, where Poupart's ligament has been much stretched and its connection with underlying tissues loosened, a radical operation is not such a simple matter. Prof. J. H. Nicoll¹ of Glasgow publishes a paper read before the British Medical Association last year at Manchester, and this adds another, and a very rational method, to the recognised plans of dealing with this troublesome condition. The sac is first exposed and isolated through any suitable incision. It is opened longitudinally in the middle line, and emptied of its contents. The abdominal aspect of the crural ring is now cleared for a distance of one inch all round the neck of the sac, which is then bisected longitudinally, and one half is threaded through another incision made in the second half near to its neck ; the two halves are by this manœuvre interlocked. The whole sac is then reduced through the femoral canal into the extraperitoneal space previously cleared for it, and lies as a pad over the internal aperture of the canal ; this part of the procedure is similar to that practised by Macewen for inguinal hernia.

The closure of the canal is the peculiar feature of this operation. An incision is carried transversely down to the bone from the inner border of the femoral vein along the pubic ramus to the region of the pubic spine ; this will usually be an inch or an inch and a half in length, and divides the pubic portion of the fascia lata, the origin of the pectenue and the periosteum. The periosteum is now detached downwards to a suitable extent to expose the pubic ramus, and one, two, or three holes are drilled through the bone according to the size of the hernial aperture ; as a rule, two holes will suffice. A loop of stout catgut is then passed through one of the openings and divided in the centre ; and the two portions threaded on a curved needle are passed at slightly different levels through Poupart's ligament, and finally back through the second hole, the ends being tied to their fellows over the bridge of bone between the holes. By means of these

¹ *Scottish Med. and Surg. Journ.*, December, 1903.

"mattress" sutures, Poupart's ligament is securely drawn down to the inner aspect of the pubic ramus, and any desirable amount of constriction can be secured. The flap of periosteum and fascia is now stitched back into place in union with the anchored Poupart's ligament, and the skin-incision may be closed.

A somewhat similar procedure has been practised by Roux, but he attaches Poupart's ligament to the bone by means of a Η-shaped metal staple. The objection to this procedure lies in the introduction of a metal foreign body, which necessarily must be provided with sharp points. Injury to the bone may follow such a procedure, and should it not heal comfortably, another operation will be required for its removal, and then possibly a detachment of Poupart's ligament from the pubic ramus might result. Should it get loose and not be removed, it is an unpleasant neighbour for the femoral vein. Then, too, Poupart's ligament can only be attached to the anterior aspect of the pubic ramus by the staple; by Nicoll's method of suture, it is drawn down and fixed to the posterior aspect of the bone, and this is obviously desirable.

HERNIA OF VERMIFORM APPENDIX.

The presence of the vermiform appendix in a hernial sac is not very uncommon, but it is not so frequent as to be unworthy of notice, particularly as it may give rise to special complications. A useful reference to the subject is made by Sheldon,¹ who relates two cases and states that the appendix may be expected to be found in a right inguinal sac in about 1 out of every 50 cases operated on. This is probably rather a higher estimate than is accurate. It is usually associated with a number of adhesions which are the result of inflammatory attacks after the appendix has reached the sac. It is generally irreducible, and the sac feels thickened. The hernia is often tender on deep pressure, and the pain thus produced may be referred to the umbilicus. Occasionally it is possible to recognise the appendix as a rounded tube passing down the sac. Attacks of inflammation occur in the sac from time to time, and this should suggest a correct diagnosis. A more elaborate account of this condition has been supplied by Levy²

¹ *American Medicine*, October 24, 1903.

² *Archives Prov. de Chirurgie*, July, August, and September, 1903.

of Nancy, and any who wish to study this matter in further detail may well look here for information.

TORSION OF THE OMENTUM IN HERNIA.

Torsion of the great omentum is an accompaniment of hernia occasionally observed. The first case reported was in 1892 by Oberst, and there is no further mention of it until Demons related a second case in 1892. Twenty-two cases have now been received, and the fact that, of these, eighteen date from 1900, suggests that the condition is not so extremely uncommon. A *resume* of twenty of these cases is supplied by Vignard and Giradeau¹ of Nantes, whilst three other cases are related by Rudolf.² A few particulars of this condition culled from these communications are worth noting. It is practically always associated with an inguinal hernia, and that much more frequently on the right side. It is usually an old-standing hernia, sometimes congenital. The size of the hernia does not seem to have influenced the condition, and in a considerable number of the cases the rupture was reducible, at any rate up to the time of the trouble, and controlled by a truss. In most instances the torsion seems to have been determined by some accidental strain or effort at lifting a heavy weight, and the symptoms sometimes commenced abruptly; but occasionally there were abdominal symptoms, pain, colic, etc., preceding the acute manifestations. The omentum descended into the sac and became twisted, inflamed, and adherent, but there were no signs of strangulation. Sometimes the omentum was twisted merely upon its upper attachments, but in other cases it was adherent above and below, and a double twist resulted from this. In still other instances complex varieties of torsion arose from individual peculiarities. At first the omentum becomes merely engorged, and then is likely to contract adhesions to surrounding tissues, whether inside the abdomen to the viscera, or outside to the hernial sac. Later, when the constriction is more severe, a good deal of blood-stained fluid exudes, both into the omentum and from it into the abdominal cavity. Finally sloughing occurs, if the condition is left unrelieved long enough, and possibly peritonitis

¹ *Archives Provinciales de Chirurgie*, April, 1903.

² *Wiener klin. Rundschau*, November 1, 1903.

would follow ; but there are no records as to what would happen under these circumstances, as most of the cases have been operated on and done well, and there has been only one death amongst them. The symptoms generally commence with severe pain in the right iliac fossa, and the scrotum, which has been usually occupied by a hernia, becomes enlarged, tender, and distended ; the hernia is irreducible. This outbreak may have been preceded by colicky pains and sickness for some time. The pain is of a spasmodyc, gripping character, and is bad enough to make the patient go to bed ; it may then improve for a time, but always gets worse again. The seat of maximum tenderness may be in the scrotum, but in several instances has been at McBurney's spot, thus causing the symptoms to simulate appendicitis. Vomiting occurred in a third of the cases, and was of a bilious type. Constipation is usual, and there may be a total cessation of the passage of gas and faeces. The pulse is accelerated, but the temperature is most frequently normal or but very slightly raised. The abdomen is distended, and may contain free fluid. The scrotum, as already mentioned, is enlarged ; and extending upwards from the hernial region, a sensitive swelling may be detected in the appropriate side of the abdomen, which is dull on percussion, and sometimes reaches up to the epigastrium. This prolongation upwards from a hernial region should suffice to suggest to the surgeon the character of the case, but hitherto a diagnosis has only been reached in very few of those recorded. Certainly in five of the cases a diagnosis of appendicitis was given, and the general features in many cases are very deceptive. The absence of fever and the extension upwards of the omental mass ought to put one on one's guard against such a mistake. The treatment is obviously operative, and consists in removal of the omentum. As already mentioned, the prognosis is good.



DISEASES OF THE UPPER AIR-PASSAGES: CONSIDERATIONS ON SOME RECENT WORK.

By STCLAIR THOMSON, M.D., F.R.C.P. (LOND.), F.R.C.S. (ENG.).

Assistant Physician for Diseases of the Throat in King's College Hospital; late Physician to the Throat Hospital, Golden Square, and Surgeon to the Royal Ear Hospital.

I.—AFTER-TREATMENT OF INTRA-NASAL OPERATIONS.

It is interesting to note how, when some advance has been made in a subject, it is found that several workers have arrived at the same point, although they may have had no intercommunication during the march and may even have started from different countries. I have before me articles published during the past year in France, Germany, America, and England dealing with the question of the after-treatment of intra-nasal operations ; and although they show some divergence of view between individual observers, yet there seems to be a general consensus of opinion that the post-operative treatment of nasal cases has been overdone, that the old axiom of *primum non nocere* has been neglected, and that better results are obtained by more of a watching policy and less of masterly interference.

It may be news to some readers that "*the duration of healing* after operations for the removal of spurs, &c., from the septum demands about four weeks in uncomplicated cases;"¹ yet I must confess that it is not at all unusual to watch granulations forming for four, up to even six, weeks on a septum from which a limited spur has been smoothly removed—and that, even, in the absence of all post-operative dressing. In addition to the slow healing of wounds on the septum, the results of operation on that structure are not always satisfactory. At the moment of operation a large obstruction may have been removed, and the air-way may appear more than adequate. But later on, an excess of repair appears to start ; reaction may take place in the nasal cavity ; and if the surgeon escapes the misfortune of an adhesion which makes the last

¹ Moritz Schmidt: *Die Krankheiten der oberen Luftwege*, 3te Auflage, 1903, p. 597.

state of his patient worse than the first, he may be vexed to find that his client is disappointed at having gone through so much to obtain so little relief, and then goes off to some other practitioner to see "if something more cannot be done!" This, it is needless to say, only occurs in a certain number of cases; and it is chiefly in these that the surgeon puts forth all his post-operative armamentarium in a bold attempt to maintain the air-way he has secured, and stave off the returning stenosis. With a sinking heart he sees the nasal walls once more closing in upon his work, in spite of gauze plugs, rubber or celluloid plates, metal splints, the passage of bougies, daily visits to the consulting-room for the removal of crusts and granulations, and the free use of douches, sprays, and ointments. No wonder that in a recent debate¹ Mr. Butlin exclaimed: "The more one does for some patients, the worse they seem to be. . . . There have been patients with nasal troubles on whom I have operated, whom I have heartily wished I had never seen."

As we are all agreed that in many instances we have no difficulty at all, it behoves us to see on what these disappointing cases depend. Now the first fact which, it seems to me, we must realise is that *operations on the septum attended by loss of mucous membrane are apt sometimes to be very unsatisfactory*. Not only is the healing slow, as already mentioned, but if there is the slightest abrasion of the mucous membrane on the outer wall, a troublesome adhesion is likely to occur; the increase in the air-space is not proportionate to the amount of tissue removed; and, with time, the gain is apt to disappear. This latter drawback would seem to be dependent on the resiliency of the septal cartilage; the septum being too large in its vertical diameter for the nasal cavity, tends to bulge again into the obstructed nostril. It possibly does so even more than before the operation, as the thickened portion—Nature's attempt at a buttress—has been removed, and the thinned partition is the more pliable.

In common with many observers I have in consequence for some time been inclined to dissuade patients from having the septum interfered with, and advised them to have their

¹ *Proceeds. Laryngol. Soc. Lond.*, November 6, 1903.

nasal stenosis relieved by removing some portion of the inferior or middle turbinal. Of course, where a definite spur occurs on an undeviated septum, it can readily be sawn or shaved off. If the deviation is a regular one and limited to the anterior part of the cartilaginous septum, it can frequently be rectified by an Asch operation, *i.e.*, by making a crucial incision in it, fracturing the four triangular portions at their base and thrusting them into the vertical line.

The next cause of disappointment is the galvano-cautery.— This has been far too freely used in the past by everyone, and is still employed too thoughtlessly. Not so long ago, a friend in general practice wrote to me that "he had bought a galvano-cautery and was busy frizzling up polypi!" Later on in this chapter I shall have occasion to point out that in the treatment of polypi the actual cautery should very seldom, if ever, be used; and I feel very strongly that there is so little need for this instrument that no general practitioner need think of providing himself with one, even although he may engage in a good deal of rhinological practice. It is one of the most common causes of troublesome adhesions in the nose. Even when used so carefully that it only comes in contact with one wall of the nasal chamber, the heat emitted is apt to injure the opposing mucosa to such an extent that a band forms across. The reaction produced by the red-hot cautery-point passes far beyond the tissue immediately destroyed, and doubtless in many cases favours the very condition, say of cedematous fibroid hypertrophy, which it is intended to remove. Finally—the most convincing objection of all—the treatment has frequently to be renewed, and seldom gets quit of the condition which it is intended to cure. On the septum the application of the galvano-cautery is apt to give rise to a patch of dry scar-tissue, to a traumatic ulcer, or even to a perforation. It is well known, but it will bear repeating, that one of the most risky forms of treatment is the application of the cautery to the middle turbinal. It acts by producing a thrombosis of the veins, and in such a region these will easily become infected, especially in the presence of any pus, so commonly met with in the neighbourhood of the ethmoid. Now part of the ethmoidal blood from this region issues by the ethmoidal vein to enter the skull and join the ophthalmic vein. The risk of

meningitis or of intra-cranial phlebitis is evident, and such is much more likely to occur in this region than with the use of the cold snare, the curette, or the forceps.

Let us now ask, *what are the anxieties we incur in operations in the nose?* The following are the chief dangers:—Haemorrhage, both primary and secondary; sepsis; shock; adhesions; insufficient removal of stenosis; and removal of too much tissue, with consequent dry rhinitis and pharyngitis. Let us consider them *seriatim*.

Hæmorrhage.—Bleeding at the time of operation can now be almost completely controlled by adrenalin and cocaine, so that an operation in the nose can be carried out with as little loss of blood as in a limb with an Esmarch bandage on it. The possibility of secondary haemorrhage is that which is most to be feared, and amongst the speakers at the Laryngological Society, Semon, Waggett, Tod, Tilley, and Watson Williams were of opinion that the tendency to this had been increased since the introduction of adrenalin. In common with Pegler and Furniss Potter, my own experience does not support this view. The difference of opinion may depend on the method in which the drugs are used, the time elapsing between their application and the inception of the operation, and the after-treatment. How is this haemorrhage to be avoided? The primary haemorrhage will nearly always cease spontaneously, if no active attempt is made to staunch it directly. It is better to let the nose bleed a moderate amount and then encourage the patient to breathe deeply through the nose. If he be unconscious, there is no better treatment than to turn him on his side and allow the blood to flow forward, while his face and neck are freely sluiced with ice-cold water. As regards secondary haemorrhage, the important point is to avoid plugging the nose. In the Manhattan Eye and Ear Hospital "for several years past all forms of tampon have been abandoned and with the most gratifying results."¹ Luc has lost a patient from meningitis consequent on the removal of polypus, followed by plugging. It is to the latter proceeding that he attributes the misfortune, and he now systematically abstains from any but a temporary plug.² In this he is in

¹ T. J. Harris: *The Post-Graduate*, June, 1903. New York.

² *Revue hebdomadaire de Laryngologie*, XXIV., No. 46, November 14, 1903, p. 597.

accord with most rhinologists. At most, a piece of gauze wet with peroxide of hydrogen should be packed in lightly, and removed as soon as the patient can lie down quietly. If a patient is a "bleeder" and the nose must be tightly plugged, the tampon should be changed at the end of six hours, and the nose thoroughly cleansed with peroxide. If a splint must be used in the nose, the soft rubber ones introduced by Lake are the pleasantest, safest, and most effective.

I have thought that in my own cases haemorrhage has been avoided by the administration of a hypodermic injection of $\frac{1}{8}$ th grain of morphia at the end of an operation, and by the avoidance of alcohol and the administration of a good aperient beforehand.

Sepsis.—Needless to say that as scrupulous care should be taken with all instruments and dressings, and with the surgeon's hands, as for any of the so-called "major operations" of surgery. The greater safety with which private operations can be done in nursing-homes is doubtless due to the greater security there is in them against zymotic diseases or contamination with sewer-gas. Equally important is it to see that auto-infection of the patient is not induced by the damming back of pus by traumatism or interference with drainage. The case of Luc has already been mentioned; but other cases are on record where septic meningitis occurred in the absence of any plug, and where death was attributed to the removal of a polypus or the curettage of an ethmoid, when, as a matter of fact, it was really due to the traumatism setting up an acute condition in some latent empyema of the sphenoid or frontal sinus. Hence a good rule is, not lightly to undertake any operation in the nose until as complete a diagnosis as possible has been established.

Shock is not altogether unknown even in the minor operations of nasal surgery. It is most to be feared in elderly people, in whom also an alarming secondary haemorrhage will sometimes start even after such an apparently trifling proceeding as the removal of a nasal polypus. It is one of the reasons why there is now a tendency to give a general anaesthetic, so that all operative measures can be carried out calmly and thoroughly, with the patient properly prepared, and without

the attendant risk of a journey home from the surgeon's study and immediate return to the unrest of life.

Insufficient removal of the stenosis is best met by carefully planning beforehand exactly what will be required to secure adequate air-way, and then removing a little more than actually appears necessary. So long as a fair amount of the inferior turbinal is left—about two-thirds at least—there is little risk of setting up atrophic rhinitis or pharyngitis. Moriform enlargements of the posterior end can always be removed with benefit. The anterior end of the middle turbinal is frequently at fault, and its amputation, when called for, is not contraindicated, if there is an active inferior turbinal on the same side.

Removal of too much tissue is a disastrous proceeding, as it can never be replaced, and at present we have no remedy for it. It chiefly applies to operation on the inferior turbinal, and hence the entire removal of this structure should never be permitted. As regards the septum, a perforation should be avoided, although many patients are so little affected by it that they are unconscious of its presence.

In conclusion, it is clear that in the after-treatment of nasal operations we have made progress in the way Herbert Spencer so often pointed out as the route generally followed by humanity. That is, we have only gone right after having gone wrong in every conceivable direction, and the last thing we have learned is—when to leave matters alone! We have also learned more of the possible dangers of operation, and how to avoid them. Both the profession and the public have also to realise that much of the treatment of a former date was less effective and perhaps more risky than operations carried out under general anaesthesia and with all the safeguards of modern general surgery.

II.—NASAL POLYPUS.

Nasal polypus is as old a subject as any in medicine: the views of Hippocrates are still quoted with interest. Yet, in spite of all the opportunities for study presented to the profession in the succeeding centuries we are far from finality on the question. It is only recently that we have dismissed the opinion that histologically a nasal polypus was a myxomatous

tumour, and we are yet undecided as to its pathology, while the prognosis remains obscure and the treatment is often unsatisfactory.

Histologically a nasal polypus is not a new growth ; it is an inflamed overgrowth of structures normal to the part in which it originates. Hence, according to its age and position, it may vary in structure from a simple œdema of the mucosa up to what might be regarded as an œdematous hypertrophy. Under the microscope, polypi are seen to consist of a loose fibrous stroma the meshes of which are filled with serous fluid. The surface is covered with epithelium—columnar and ciliated in parts, and in parts cubical ; it may even be deficient. Glands, vessels, and nerves are found in the growth. The glands may become obstructed or pressed on by inflammatory exudation, and in this way the cysts are formed which are often met with, particularly those growing far back. Scattered through the growth, and more marked in the rapidly-growing polypi, are masses of inflammatory round cells.

Turning now to the *pathology*—the *aetiology*—of the disease, how does the case stand ? Twenty years ago Morell MacKenzie said that the cause of nasal polypi was unknown. Soon afterwards Woakes enunciated his view that the formation of such polypi depended on underlying disease of the bone, commencing with fibrosis and going on to obliteration of the arteries and absorption or necrosis of the bone. He submitted pieces of removed ethmoid to the independent microscopical examination of Thurston and Sidney Martin, both of whom reported definite bone-changes in a considerable proportion of cases. The views of Woakes were met with what it is no exaggeration to call a storm of opposition. Amongst those who investigated the subject and declared against the theory of Woakes were such well-known authorities as MacDonald, Jonathan Wright, Swain, John MacKenzie, Hopman, Chiari, and Hajek. While agreeing that in many instances the bone was affected, most observers came to the conclusion that it was not the primary source of the polypi, but that the inflammatory process attacked it secondarily. Hajek categorically stated that the direction of the morbid process was from without inwards and not from the bone outwards.

This question is not one of mere academic interest. It must, if the theory of Woakes be adopted, lead to a different prognosis and more radical treatment. However, the views of Woakes, after much stormy discussion, came to be more or less disregarded, although it must be confessed that many rhinologists were induced no longer to limit operative treatment to the inflammatory growths, but vigorously to attack the underlying bone. Within the last two years the views of Woakes have been revived by Lack, and this time—so curious is the reception of new ideas, even in the “learned” professions—they have not only received a complete hearing, but they have gained a number of adherents, at least in this country. Lack's investigations were first submitted to the Laryngological Society,¹ and he has lately enunciated them in a more didactic form.² He agrees with latter-day observers that nasal polypi should be regarded “as simple localised patches of oedematous mucous membrane”; but he differs from many, Woakes excepted, in considering that “this oedema depends upon a rarefying osteitis of the underlying bone.” He supports this contention by criticising and ruling out of court the views of those who attribute many cases of nasal polypi to sinus-suppuration or to modified granulations. As positive evidence in his support, he adduces the microscopic appearances of the removed bone, and the clinical evidence obtainable by the detection, beneath the polyps, of broken-up spicules of bone, which is sometimes rough and bare. Finally, he arrives at the consideration, whether the diseased bone is the cause of the polypi, or the polypi are the cause of the diseased bone, and decides in favour of the former alternative. He decides this from the result of operation. If a severe case of polypi is treated by removing the polypi only, recurrence is certain. If, on the other hand, the bone is also removed, recurrence is a rare event. The beneficial result of removing the underlying bone has previously been pointed out by Morell Mackenzie, Pirogoff, Fergusson, and others.

Personally, like a well-known statesman, I have “no settled convictions” on this matter, but I think that more

¹ *Proceedings*, 1902.

² *The Clinical Journal*, 21 October, 1903.

research is necessary before we can accept the test of operation as conclusive evidence. The bone may be so diseased that eradication of the polypi is impossible except by clearing away all carious bone, but that fact alone does not invalidate the contention that inflammation may have primarily attacked the mucous membrane and only spread secondarily to the bone. When Dr. Lack states that "bone-disease is a constant concomitant of nasal polypi" he commits himself to rather a sweeping statement, as he also does when he writes that "polypi grow only from the ethmoidal region of the nose." They are certainly only found in this neighbourhood, but Zuckerkandl has shown that their origin — their point of insertion — may be in one of the accessory sinuses. I have certainly had some cases in which no bone was removed, and in which simple removal of the polypi was followed by no recurrence within two years. Other cases were associated with sinus-disease, and only ceased to recur when the latter was treated.

This uncertainty as to the pathology—and therefore as to the prognosis and correct treatment—is further illustrated by a paper of J. Payson Clark of Boston, who has kept a careful record of 147 cases of nasal polypi.¹ It is curious to note that he makes no reference to the revival of the Woakes theory, which has attracted so much attention amongst British rhinologists, but he refers to the matter in the following words : "As to the theory of some writers that all nasal polyps owe their origin to ethmoid disease, I will only say one word. As long as many skilled and careful observers see cases in which, after the most painstaking scrutiny, they can find no evidence of ethmoid disease, and as long as there are other conditions which can just as reasonably be considered causes, it seems to me that the burden of proof lies with those who hold this view, to show that ethmoiditis exists in these cases and to show us a satisfactory method of determining its existence." Now if Payson Clark means to maintain that it is not yet settled that ethmoiditis is the cause of recurring nasal polypi, many will agree with him. But if his view is that ethmoiditis does not "exist" in the majority of recurring

¹ *Boston Medical and Surgical Journal*, July 2, 1903; and *Trans. American Laryngol. Assoc.*, 1903.

cases, he appears to contradict himself, for later on in the same paper, under the heading of "Treatment," he writes : "In those cases where the growths are numerous and diffuse, the middle turbinate will usually be found to be so deeply affected by the process that only its thorough removal will suffice to eradicate the disease."

In a recent paper, Francis R. Packard¹ gives full particulars of complete observations on six cases, and states that he is "convinced that in all six cases the polypi were present as a result of the disease of the bone."

But the danger of thus mistaking effect for cause is pointed out by Jacques of Nancy in an article embodying the most complete consideration of the subject which has appeared for some years.² After reviewing the history of our knowledge of this condition, he gives his own researches into the histology of nasal polypi. These lead him to the now generally-recognised view that they are not true neoplasms, but localised oedematous hypertrophies of the pituitary membrane, inflamed or not inflamed. As to their situation, he finds that in nearly every case they originate from the ethmoidal mucosa, particularly where it is thin and lax, or where it is least supported and most exposed to contact with irritating secretions from inflamed accessory sinuses.

The various causes which have been suggested to explain the occurrence of polypoid degeneration of the nasal mucosa are thus tabulated by Jacques :—

I. PHYSICAL CAUSES.

A. Anatomical.—1. *Abnormal narrowness of the nasal fossæ, obliging the patient to make repeated efforts at clearing them.* 2. *Abrupt bending of the vessels in the ethmoidal mucosa opposite spurs, predisposing to stasis and oedema.*

B. Irritative.—1. *Foreign bodies.* 2. *Local traumatism.*

II. INFLAMMATORY CAUSES.

A. Primarily attacking the bone.—1. *Necrosing ethmoiditis.*
2. *Rarefying ethmoiditis.*

¹ *Trans. American Laryngol. Assoc.*, 1903.

² *Société Franc. de Laryngol.*, Octobre, 1903; *Rev. hebdom. de Laryngol.*, XXIV., No. 44, October 31, 1903.

- B. Primarily attacking the mucosa.—1. *Simple chronic catarrh.*
2. *Specific local infection.* 3. *Suppuration in the neighbourhood.*

III. NERVOUS CAUSES.

1. *Spasmodic rhinorrhœa.* 2. *Hysteria.*

The reader will see that there is an ample choice of possible causes! We need not pause to consider all of them. That some cases may be due to exceptional narrowness of the nasal chamber appears to me to be possible, since I have several times been struck with the discovery of polypi behind a very much deviated septum. Jacques dismisses the views of Woakes and Lack as being based chiefly on clinical arguments and not susceptible of close criticism. He points out, as I have already suggested, that the so-called necrosing ethmoiditis is not so much a primary ulcerative process, as a secondary inflammatory condition, with softening and more or less marked absorption of the ethmoid plates. For this to occur, it is necessary that the lesions should be of old standing. After giving consideration to all the views tabulated above, Jacques appears to consider that pathological secretions of all kinds in the nose, and therefore chiefly the pus of sinusitis, are the chief immediate causes of polypi. With this view I am disposed to agree. Some time ago I started collecting statistics from my own practice of the frequency with which pus in the nose was associated with simple polypi, and the number of cases in which a regrowth of the polypi ceased with the treatment of the affected sinuses. In this research I was interrupted, but, so far as it went, it was most confirmatory of these views. Their importance will be recognised in the next section.

Treatment.—There are few practitioners who do not consider themselves able to deal with what they consider such a simple affair as nasal polypi, from the general surgeon who blindly dives into the nose with a pair of stout forceps and brutally tears out all that he can grasp, up to my friend who “frizzles” them up with his lately-purchased galvano-cautery! Yet the wonder is that more accidents do not occur, and that the nasal mucosa should be so long-suffering.

Treatment should be both symptomatic and causal. In other words, the polypi must be got rid of, while their recurrence is

prevented by treating the cause. It is hardly necessary to say that treatment by any general or local medicament is useless, and that the use of astringent powders or lotions, sternutaries, setons, torsion, and compression have passed into the limbo of medical history, where they should be followed by chemical and thermic caustics and my friend's "frizzling" galvano-cautery. I think that we are all agreed nowadays, that the cold wire snare (Krause's or Blake's) is the most suitable instrument for getting rid of the main mass of nasal polypi, although in many cases it must be supplemented by the ring-curette or punch-forceps. If only one or two polypi exist, and these are distinctly pedunculated, removal with the snare may bring about a permanent cure, especially if the pedicle is not cut through, but is torn or "yanked" out, so as to bring with it some of the neighbouring oedematous tissue. Where the polyps are numerous and diffuse, and found growing along the banks of the hiatus semilunaris or from the middle turbinal itself, it will be necessary to attack the affected bone with punch-forceps, such as those of Grünwald, Hartmann, or Luc,¹ and in order to get at the middle meatus we must often begin by removing the anterior end of the middle turbinal. With the field of operation well illuminated, and guided both by sight and the probe, the forceps should work outwards towards the orbit, avoiding the dangerous route between the turbinal and the septum, which leads upwards to the cribriform plate. This method, which may require a few sittings, is greatly facilitated by the previous application of adrenalin and a 10-per-cent. solution of cocaine. It is particularly suitable to the posterior ethmoidal cells. The method of putting the patient under a general anaesthetic and scraping the diseased area with a ring-knife—guided only by the sense of touch—cannot be recommended.

When the anterior ethmoidal cells are diseased, an external operation through the ascending process of the maxillary process is the only effective method of reaching the region, but it is seldom that symptoms justify such a measure. There are cases in which a patient with nasal trouble will find it safer, as effective, and more economical to visit his medical man two or

¹ *Trans. American Laryngol. Assoc.*, 1903.

three times a year—just as he goes to see his dentist—than to submit to a serious and expensive operation of which the result cannot positively be guaranteed.

Those polypi which project into the choanæ are more difficult to coax into the snare, and it is sometimes necessary to hook them forward with a crochet (such as Cresswell Baber's), or else to push them into the wire-loop with the forefinger of the left hand introduced into the naso-pharynx. These polypi justify the use of the old polypus-forceps—also guided by the left forefinger in the choana—for which there is otherwise no justification nowadays.

The galvanic snare used to be employed with the object of preventing haemorrhage, and the galvanic cautery was formerly used extensively for "destroying the roots" of the polypi. Bleeding is never excessive in the case of simple polypi and may be salutary. The cauterising of the roots was based on a mistake in pathology, and the inflammatory reaction can only be harmful.

As to after-treatment, the reader is referred to the principles laid down in the first part of this paper.

Coming now to the causal treatment of polypi, I think it unnecessary that those patients who can afford it should be rashly put to the inconvenience and expense of change of climate when its effect appears so dubious. This particularly applies to untreated cases. I lately saw a patient who was told to "summer" in Colorado and winter in Algiers for bronchial catarrh. The physician had omitted even to inquire about the nose, which was nearly blocked with polypi! Another patient, although aware of his polypi, wintered in Egypt and spent the summer on our east coast, as he was "opposed to operations" and had settled for himself that these were two of the driest climates he could find! Although climatic conditions do not appear to have any causal connection with polypi, there are numerous cases which are made more uncomfortable in moist conditions of the atmosphere.

At present the chief causal indications are to be found in the nose. Any streak of distinct pus in the midst of a bunch of polypi should be carefully traced to its source. It may originate in one or more of the accessory cavities, and, until

these are drained, the polypi will recur. Hence the importance of a guarded prognosis, for even though a maxillary sinusitis may easily be located, it is often only in the course of treatment that other cavities will also be found diseased. Still, the means necessary to establish a diagnosis should be proceeded with as early as possible, for if the antrum of Highmore can be at once drained, there will be less risk in treating the polypi, less chance of their recurring, and greater facility in exploring the other cavities. The frequency with which the ethmoid is affected has already been mentioned.

Two important therapeutic points depend on the detection of sinus-disease as the cause of nasal polypi. One is the importance of never using a plug—for more than a very limited time, if there is uncontrollable haemorrhage—so as to avoid retention and absorption of pus; the other is the wisdom of only operating on one side at a time, and in the best general circumstances for the patient, so as to avoid extensive traumatism in a septic area.



A CASE WITH COMMENTS.

A CASE OF INCOMPLETE COÄRCTATION OF THE AORTA ;
NECROPSY.

By GEORGE R. MURRAY, M.A., M.D. (CAMB.), F.R.C.P. (LOND.).

Heath Professor of Comparative Pathology in Durham University; Physician to the Royal Infirmary, Newcastle.

[With Plates VIII. and IX.]

INSTANCES of either partial or complete coärcitation of the aorta are so uncommon that the following case, which was under my care at the Newcastle Royal Infirmary, appears to be worthy of record.

J. B., a widower, aged 48, a shipwright by trade, first came under observation in March, 1898, complaining of shortness of breath and cough. The shortness of breath had then been present for some five or six years, and the cough for about two years. In spite of these symptoms, however, he had continued his work until the beginning of December, 1897, when the increasing severity of the dyspncea had obliged him to give it up. He had had an attack of small-pox when a boy, and had suffered from rheumatism two or three years before he was seen. The right eye had been destroyed by the thrust of a stick at 28 years of age. Otherwise his previous history was unimportant. Unfortunately the notes on his condition when he was in the hospital in March, 1898, are very imperfect, and it was not until his readmission in June that his condition was fully recorded. At that time he complained of urgent dyspncea, of slight deafness, and of dimness of vision. His condition was as follows :—

Respiratory System.—He had a cough, and there was slight stridor on inspiration. The chest was large and barrel-shaped, and there was a slight inspiratory recession of the upper intercostal spaces on both sides. The chest-wall was more prominent in the first two intercostal spaces on the left of the sternum, and the percussion-note over this area was higher in pitch than on the right. The percussion-note elsewhere

was rather hyper-resonant. On auscultation loud rhonchi were audible all over the chest.

Circulatory System.—The apex-beat of the heart was situated in the sixth left intercostal space, two inches below the nipple. Two superficial arteries lying just beneath the skin, through which the pulsation was clearly visible, were seen on each side of the upper part of the sternum, one crossing the second right intercostal space, and the other lying over the second left rib-cartilage. The position occupied by these two pulsating vessels is shown in Fig. 1 (c, d), taken from a sketch

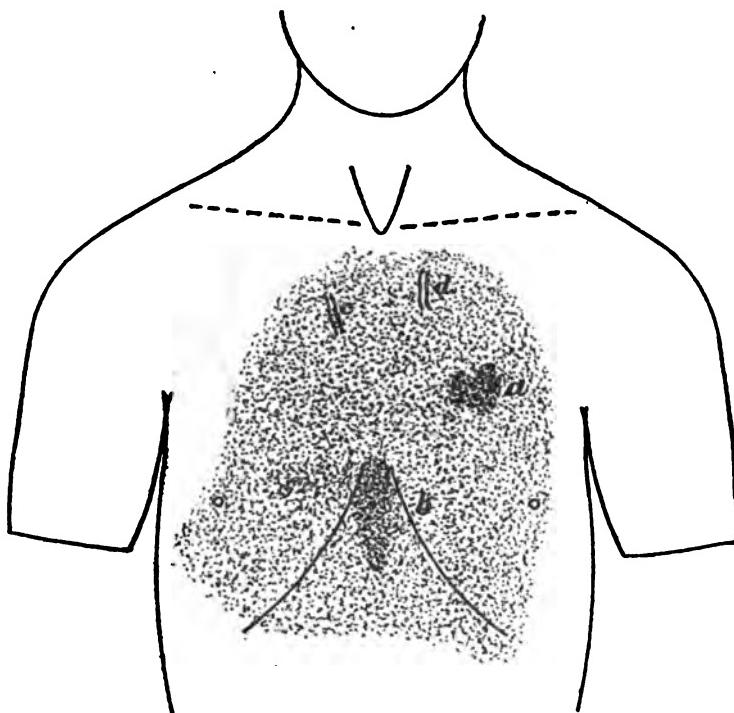


Fig. 1. Large shaded portion shows area over which murmur was audible in front.

a, b. Areas of greatest intensity of murmur.
c, d. Two superficial enlarged arteries.

made by Dr. F. S. Walker, who was house-physician at the time. Behind, four large arteries about the size of the radial artery could be seen pulsating beneath the skin. On the left,

one vessel (*c*, Fig. 2) could be seen running for a short distance in a vertical direction on a level with the inner end of the spine of the scapula, and midway between it and the middle line; and another (*c*, Fig. 2) extended from a point at the junction of the lower and middle thirds of the inner border of the left scapula downwards and inwards over the ninth rib. On the right side, similarly, two corresponding vessels (*c, c*, Fig. 2) could be seen to be enlarged in almost the same situations.

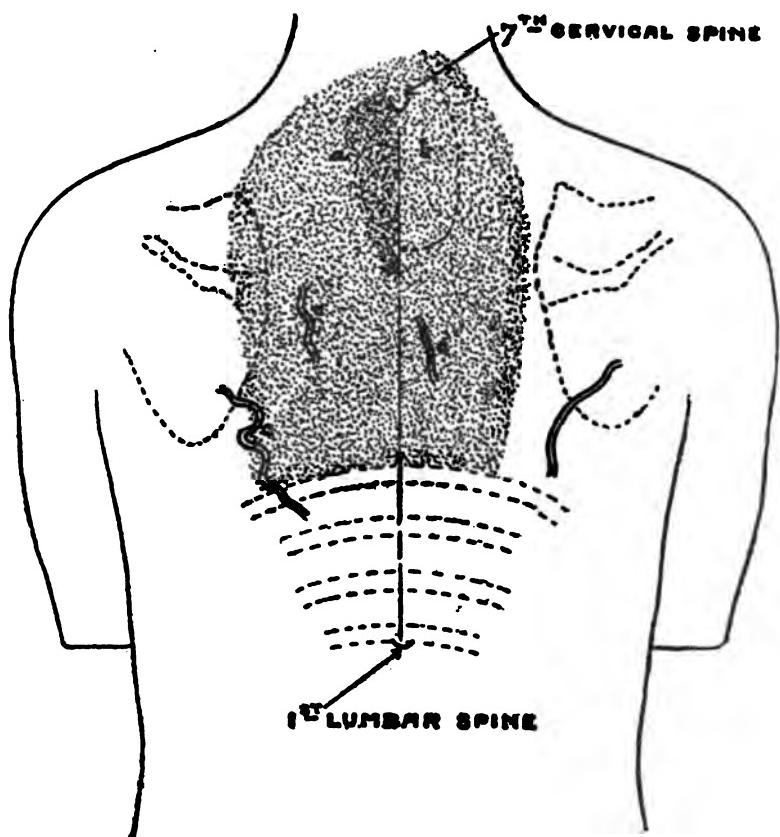


Fig. 2. Large shaded portion shows arc on which murmur was audible behind.

- a. Area of greatest intensity.
- b. Area of impaired resonance to right of spine.
- c, c, c, c. Superficial enlarged arteries.

During the patient's stay in the hospital it was noticed that no pulsation at all could be felt in the abdominal aorta. Barely perceptible pulsation was at times detected in the femoral arteries, but it was not sufficiently distinct to enable the observer to count the pulse-rate by it. No tibial pulse could be felt, and the feet were cold and cyanosed. The superficial veins in the neck were prominent and pulsating. The area of cardiac dulness was normal in extent. On auscultation in front, a systolic murmur was audible over a large area, extending from the level of the second costal cartilages above to the epigastrium below, and reaching as far out as the nipple on each side, as indicated by the shaded area in Fig. 1. The murmur was heard most distinctly to the left of the middle of the sternum, and at the epigastrium at the points marked *a* and *b* in Fig. 1. Behind, also, a systolic murmur was audible over an area extending from the seventh cervical spine above to the ninth dorsal spine below, and as far out as the inner border of each scapula, as indicated by the large shaded area in Fig. 2, the maximum point of intensity being to the left of the seventh cervical spine, as shown by the darker area at *a*.

During the month of August a distinct heaving impulse was observed just to the left of the spine, on a level with the three upper dorsal vertebræ. The left wrist and forearm were somewhat swollen, the left forearm just above the wrist measuring 7 inches in circumference as compared with the right, which measured $6\frac{1}{2}$ inches. The left supra-clavicular fossa was less deep than the right, and pulsation could be felt, as well as a venous thrill, more distinctly in the former than in the latter. At that time the pulse could be counted in both femoral arteries, and the frequency was 102 per minute.

During part of September and October there were frequent severe attacks of dyspnoea, accompanied by a sense of tightness in the chest, but with little or no pain. In October an area of dulness was found over the *manubrium sterni*, extending about an inch outwards over the first rib and intercostal spaces on each side. Over the left side of the chest vocal fremitus and breath-sounds were both diminished, while resonance on percussion was somewhat diminished, over the lower half of the chest on this side. For a few days at the end of this month a musical murmur was audible over a small area just to the

right of the spinal column, opposite the interval between the second and third dorsal spines. At the end of December, in addition to the pulsation felt at the side of the spine, deep-seated pulsation could be felt just internal to the upper inner angle of the left scapula. This could be still more distinctly felt when the arm was displaced outwards as far as possible. There was, however, no diminution of resonance as compared with the opposite side. The skin over this area was slightly oedematous.

Seven months later, in July, 1899, when the patient was again admitted to the hospital, he complained of palpitation and dyspnoea, and was expectorating frothy, tenacious mucus. The respiration was almost entirely abdominal, and there was scarcely any expansion of the chest during inspiration. The pulsation of the superficial vessels on each side of the sternum could be felt as before. The apex-beat was in the sixth left intercostal space, midway between the nipple-line and the anterior axillary line. On auscultation the first sound at the apex was found to be rather short, and the aortic second sound accentuated at the base. No murmur was audible in front. Behind, pulsation was visible on the left of the spine in the same vibration as before. The pulsation in the superficial vessels could scarcely be seen, but could be distinctly felt on palpation. The systolic murmur could be heard behind over the same area as before. The pulse was regular (88). The two radial pulses were synchronous, but the right was slightly fuller than the left. No pulsation could be felt in either the abdominal aorta or the femoral artery. The feet were warm. The patient left the hospital early in August, he returned on December 23, and died from cardiac failure on January 12, 1902.

The condition found after death was as follows :—

Heart.—The pericardium was healthy in appearance, and contained no fluid, nor were there any adhesions between the two layers. The heart as a whole was greatly enlarged. The left ventricle was increased in size, the cavity measuring $3\frac{1}{2}$ inches in length from the lowest point of attachment of the aortic valves to the apex. The muscular wall of the ventricle was enormously thickened and hypertrophied, and measured one inch in thickness. The heart-muscle was firm and healthy in appearance. The mitral valves were slightly thickened,

PLATE VIII.

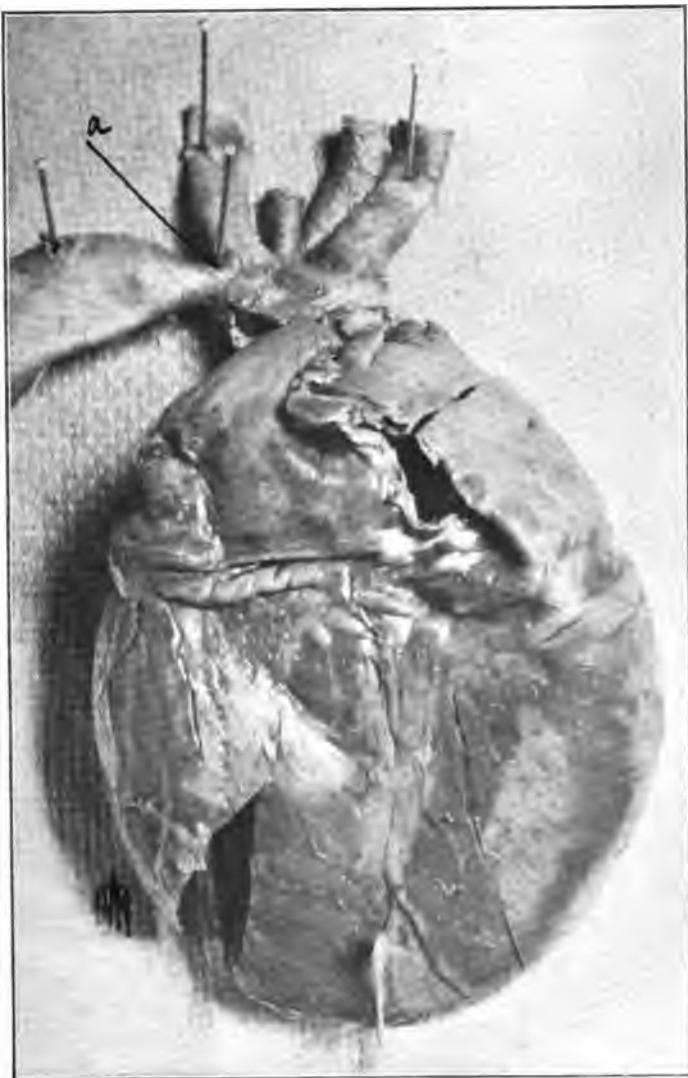


Fig. 3. *Heart and aorta from behind showing coarctation of aorta at a.*

PLATE IX.

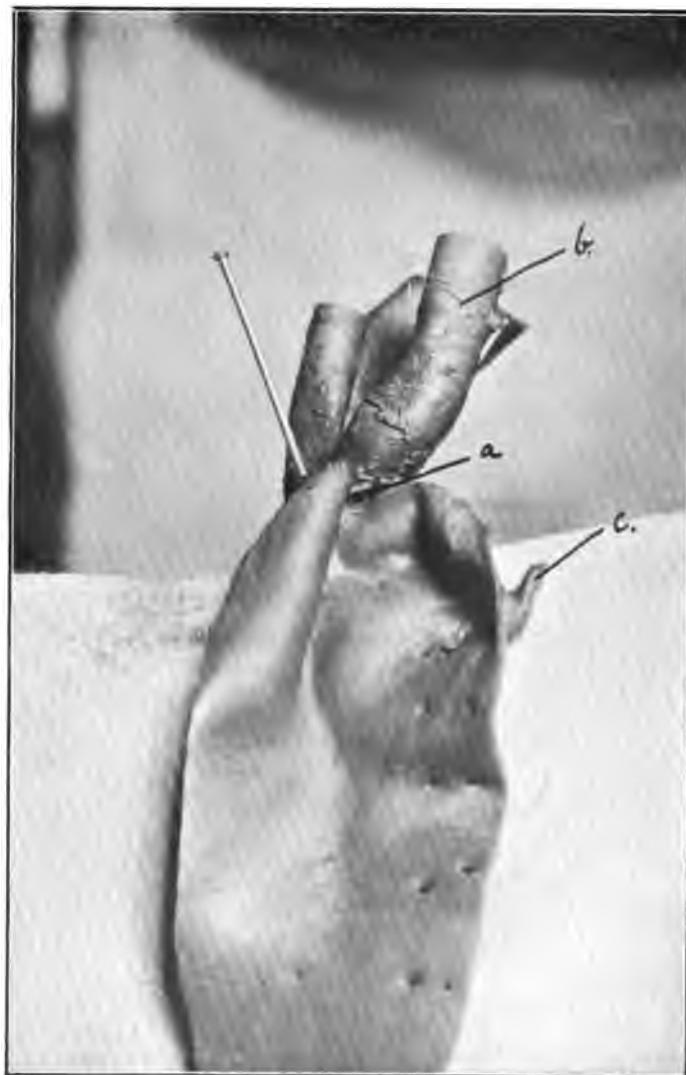


Fig. 4. *Aorta laid open on distal side of stricture showing orifice of stricture at a, left subclavian artery at b, and first aortic intercostal artery at c.*

but were otherwise normal in shape and size, and showed no signs of either recent or old endocarditis. The mitral orifice admitted the tips of three fingers. The aortic valves were quite normal. The left auricle was moderately dilated; the muscular wall was hypertrophied, and the endocardium thickened and opaque. The right ventricle was dilated, but the walls were not increased in thickness. The auriculo-ventricular opening was dilated and admitted four fingers. Both tricuspid and pulmonary valves were normal. The right auricle was dilated and the walls hypertrophied.

Aorta.—There were a few small patches of early atheroma in the lower part of the aorta just above the aortic valves. The innominate and left common carotid arteries were found to arise from the arch of the aorta by one common trunk, from which, however, the left common carotid almost immediately separated; while half an inch beyond this the innominate divided into the right subclavian and common carotid arteries. The origin of the left subclavian was in the usual situation. All these vessels were much dilated, and their walls were thickened. In the posterior and outer part of the wall of the right subclavian artery there was a small calcareous plate about the size of a threepenny piece, the centre of which was situated about $\frac{3}{4}$ in. from the origin of the artery. After preservation in formalin, the internal diameter of this vessel measured $\frac{1}{2}$ in. and the wall $\frac{1}{16}$ in. in thickness. The internal diameter of the right common carotid was $\frac{5}{16}$ in., and that of the left $\frac{1}{2}$ in., the wall in each case being $\frac{1}{16}$ in. thick. The internal diameter of the left subclavian measured $\frac{3}{8}$ in. and the wall $\frac{1}{16}$ in. in thickness. The orifice of the common trunk of origin of the innominate and right subclavian arteries measured $\frac{3}{8}$ in. across, and just beyond this the aorta became considerably diminished in size, so that the internal diameter was only $\frac{1}{4}$ in. Immediately beyond the origin of the left subclavian artery the lumen of the aorta was suddenly narrowed such an extent as to be almost obliterated; there was, however, a small orifice left leading into the descending aorta, which would just admit a round penholder $\frac{3}{16}$ in. in diameter. The appearance of the aorta at this point is shown from behind in Fig. 3. The appearance of the stricture as seen from the distal side, after the aorta had been laid open, is shown in

Fig. 4. Both these figures are taken from photographs prepared by Mr. Thompson, the photographer to the Newcastle Infirmary.

The actual stricture itself was short, being only $\frac{1}{2}$ in. in length, after which the aorta rapidly expanded again. Immediately on the proximal side of the stricture for a distance of $\frac{3}{4}$ in. the whole of the aorta was lined by a calcareous plate. This calcareous ring did not extend into the left subclavian artery, nor did it extend into the stricture itself. The first aortic intercostal arteries beyond the stricture were as large as a normal radial artery, on each side. The other intercostals were enlarged, but to a smaller degree. The aorta beyond the stricture was comparatively narrow and thin-walled. Both the internal mammary arteries were dilated to the size of a normal common carotid artery. Just opposite the stricture there was a bony outgrowth from the intervertebral disc on the left of the middle line. There were similar, but smaller, cartilaginous outgrowths from the intervertebral discs above and below this, which had not, however, become ossified.

REMARKS.

Coarctation of the aorta, either partial or complete, is so uncommon that it has rarely if ever been diagnosed during life, though the late Dr. Walshe gave a clinical lecture on a supposed case.¹ In the case now recorded the symptoms were during life erroneously supposed to be due to the presence of an aneurysm of the thoracic aorta. Various explanations of the absence of pulsation in the abdominal aorta were considered. It was thought that this might be due to the presence of a large sac which, acting as a reservoir, converted the intermittent blood-flow into a continuous one, as in a case recorded by Dr. Osler,² in which there was also pulsation in the left scapular region, similar to that observed in our case. It was also suggested that a clot had been displaced from the aneurysm and had partially occluded the aorta beyond, and that the sac of the aneurysm itself compressed the aorta beyond the mouth of the sac, and so arrested the pulsation in the abdominal aorta.

¹ *Medical Times and Gazette*, Oct. 17, 1857.

² *Practice of Medicine*, p. 780.

A careful review of the literature of the subject was made by Drs. Lee Dickinson and W. J. Fenton,¹ who recorded a case of complete coärctation of the aorta which was under the care of Dr. H. D. Rolleston at St. George's Hospital. The rarity of this condition is shown by the fact that they found that, out of 105 recorded cases, the coärctation was complete in only fourteen. The chief points upon which a diagnosis of the condition may be based are the following :—The presence of strong pulsation in the arteries of the head, neck, and arms, associated with absence of pulsation in the abdominal aorta and femoral arteries, together with enlargement and pulsation of superficial arteries, indicating the establishment of a collateral circulation by anastomosis between vessels communicating with the arch of the aorta on the one hand, and with the descending thoracic aorta on the other; well-marked evidence of dilatation and hypertrophy of the left ventricle, and in some cases of the right as well. The presence of a systolic murmur heard loudly behind to the left of the upper dorsal spine, as in my case, and widely conducted over the back, indicates that the coärctation is incomplete. When it is complete, this murmur, which is generated by the aortic stricture, is naturally absent, as it was in Dr. Rolleston's patient.

Congenital defects, either in the circulatory system or in some other part of the body, were found by Drs. Dickinson and Fenton to occur in as many as 37 per cent. of the recorded cases, one of these malformations being the origin of the left common carotid and innominate arteries from a common trunk, which was present in my case.

¹ *Lancet*, Oct. 27, 1900, p. 1196.



Public Health.

CANCER-MORTALITY AND GROUPING OF CANCER-CASES IN CHELSEA.

By LOUIS PARKES, M.D., D.P.H.,

Medical Officer of Health, Chelsea; Consulting Sanitary Adviser to His Majesty's Office of Works.

RENEWED interest has been aroused in the alleged infectivity of cancer by the publication of Dr. Jossé Johnson's address on Dr. Otto Schmidt's specific treatment of cancer, delivered before the Abernethian Society at St. Bartholomew's Hospital on November 5th, 1903. It is stated in the address that Dr. Otto Schmidt has, after many years of research, succeeded in cultivating artificially a parasite hitherto unknown and more or less undescribed. The parasite fulfilled most of the conditions necessary to prove its specificity. It was found in every malignant growth examined ; and it was capable of artificial cultivation in pure culture.

A priori there are many reasons in favour of the probability of the view that malignant growths in the human subject (carcinoma and sarcoma) are due to an infective parasite, but so far the epidemiological evidence in support of this theory has been scanty. The evidence at present accumulated seems to indicate that cancer has an endemic prevalence, and that it affects in a somewhat higher degree populations living in low-lying river-valleys with clay soils, than those residing on higher, dryer, and less retentive soils. An endemic area, such as a particular village, may be comparatively close to others in which the disease rarely occurs ; and isolated "cancer houses" or groups of such houses are said to exist in certain districts.

With the object of throwing a little more light, if possible, on the subject of endemic areas and "cancer houses," I have examined the mortality statistics for malignant cases in Chelsea during the past 13 years (1891-1903). In this period 921 deaths have occurred from cancerous or malignant diseases, 359 of the deaths being of males (39 per cent. of the total),

and 562 or 61 per cent. of the total being deaths of females. Of the total 921 deaths, 892 or 97 per cent. are traceable to the last known residence of the deceased person by means of the information supplied to the registrar. Of this total of 892, 33 were deaths of pensioners in the Royal Hospital, leaving 859 as the deaths of private residents. In 3 per cent. no definite address is given in the death-certificate.

Of the 859 deaths 763 were of persons residing at or shortly before the date of their deaths in 763 separate houses. That is to say, in the 13 years 1891-1903 only one death was registered in connection with each of these 763 houses. Ninety-six of the deaths occurred in 47 houses, namely 90 in 45 houses, or 2 in each house; and in 2 houses 3 deaths in each were recorded during the period under review. In 763 houses, therefore, a single death was recorded in the 13 years; in 45 houses 2 deaths were recorded, and in 2 houses 3 deaths were recorded. The average number of inhabited houses in Chelsea in the period under review was about 9,000.

The intervals of time elapsing between the first and second deaths in a house where two cases occurred are as follows :—

Under 6 months	- 5 cases.	5 to 6 years	-	- 2 cases.
6 to 12 months	- 2 "	6 to 7 "	-	- 4 "
1 to 2 years	- 5 "	7 to 8 "	-	- 4 "
2 to 3 "	- 4 "	8 to 9 "	-	- 2 "
3 to 4 "	- 5 "	9 to 10 "	-	- 4 "
4 to 5 "	- 7 "	10 to 11 "	-	- 1 "

From the above table it appears that in 17 cases out of 45 over 5 years elapsed between the deaths of the patients who lived at the same address, and it hardly seems likely that any direct infective agent had relation to the second case in these instances. In one of the houses where three cases occurred, there was an interval of three years and seven months between the first and second death, and of two years and nine months between the second and third death. In the other house (No. 88 L. Street), where three cases occurred, there was an interval of one year between the first and second death, and of six months between the second and third.

No. 88 L. Street is a tenement-house of seven rooms

inhabited by a somewhat shifting and uncertain population. L. Street during the past 13 years has been characterised by a somewhat undue proportion of cancer-deaths amongst its residents. The street consists of about 100 small, mostly four-roomed houses of old-fashioned type, containing about 600 inhabitants of the working class. There have been 20 deaths from cancer in this street during the 13 years, being a proportion of one death annually to every 390 inhabitants, whereas the proportion for the whole of Chelsea is one death annually to every 1,056 inhabitants. In this street, besides, in addition to No. 88, two other houses have each had two cancer deaths, namely 91, where six months elapsed between the first and second death, and No. 37, where two years and eight months elapsed between the deaths. The cancer deaths in L. Street occurred as follows :—

- No. 1. October 1891. M., 54. Resident of No. 10, died in hospital from cancer of stomach.
- „ 2. March 1892. M., 27. Resident of No. 50, died in hospital from cancer of liver.
- „ 3. October 1894. F., 72. Resident of No. 56, died in infirmary from cancer of stomach.
- „ 4. October 1894. M., 47. Resident of No. 97, died at home from sarcoma of kidney.
- „ 5. November 1894. F., 75. Resident of No. 87, died at home from cancer of stomach.
- „ 6. January 1896. F., 72. Resident of No. 91, died at home from cancer of uterus.
- „ 7. February 1896. F., 51. Resident of No. 89, died at home from cancer of breast.
- „ 8. July 1896. M., 60. Resident of No. 91, died at home from cancer of bladder.
- „ 9. Dec. 1896. F., 44. Resident of No. 90, died in hospital from mediastinal growth.
- „ 10. May 1897. F., 57. Resident of No. 62, died at home from cancer of liver.
- „ 11. March 1898. F., 67. Resident of No. 37, died at home from tumour of stomach.
- „ 12. April 1898. F., 47. Resident of No. 82, died in hospital from cancer of breast.

- No. 13. October 1899. M., 35. Resident of No. 8, died in hospital from epithelioma of cheek.
,, 14. November 1900. F., 55. Resident of No. 37, died at home from cancer of uterus.
,, 15. March 1902. F., 42. Resident of No. 88, died in infirmary from cancer of uterus.
,, 16. December 1902. M., 58. Resident of No. 73, died in infirmary from cancer of oesophagus.
,, 17. January 1903. F., 64. Resident of No. 22, died at home from cancer of uterus.
,, 18. February 1903. F., 33. Resident of No. 88, died at home from cancer of uterus.
,, 19. September 1903. M., 66. Resident of No. 88, died in hospital from cancer of tongue.
,, 20. September 1903. F., 35. Resident of No. 44, died in asylum from cancer of uterus.

In L. Street the odd and even numbers are on opposite sides of the street, and the high and low numbers on each side are nearly facing each other. Cases 4, 5, 6, 7, and 8 form a little consecutive group occurring in four houses on the same side of the street close to each other, and case 9 occurred in a house almost exactly opposite. The period intervening between the first and last deaths of these six people was only a little over two years.

Other instances of grouping of cases in houses lying near each other occurred, of which the following may be taken as examples. The cases in A. occurred in adjoining houses :—

A.

- No. 1. March, 1891. M., 44. Resident of No. 6, W. Grove, died at home from cancer of palate and cheek.
,, 2. November, 1894. F., 58. Resident of No. 6, W. Grove, died in hospital from cancer of breast.
,, 3. January, 1895. M., 69. Resident of No. 4, W. Grove, died at home from cancer of rectum.
,, 4. October, 1899. M., 67. Resident of No. 4, W. Grove, died at home of cancer of liver.

B.

- No. 1. May, 1900. M., 47. Resident of No. 39, D. Road, died in hospital from cancer of oesophagus.

- No. 2. October, 1900. M., 39. Resident of No. 39, D. Road, died at home from cancer of stomach.
 " 3. January, 1901. F., 57. Resident of No. 35, D. Road, died in infirmary from cancer of rectum.
 " 4. May, 1901. F., 32. Resident of No. 35, D. Road, died at home from cancer of uterus.

Nos. 35 and 39, D. Road, are on the same side of the street, but separated by No. 37.

C.

- No. 1. June, 1894. F., 59. Resident of No. 4, P. Walk died in asylum from cancer of breast.
 " 2. February, 1895. M., 55. Resident of No. 4, P. Walk, died at home from cancer of thyroid.
 " 3. May, 1897. F., 50. Resident of No. 11, P. Walk, died in infirmary from cancer of uterus.
 " 4. December, 1901. F., 58. Resident of No. 11, P. Walk, died at home from cancer of breast.

In this group Nos. 4 and 11, P. Walk are nearly opposite each other.

These groupings of cases, as seen in L. Street, W. Grove, D. Road, and P. Walk, may be mere fortuitous occurrences, but there is a slight suggestion about them of some quality appertaining to the houses affected, or to the neighbouring locality (as in L. Street), which is instrumental in the propagation of cancerous affections. It is impossible to say that these groupings of cases, either in the above specific instances or in the other instances before mentioned where two and three cancer-deaths have occurred in a single house in the thirteen years under review, are due to any direct infective quality of cancer. At any rate, where a period of more than five years has elapsed between the deaths of patients who resided in the same house (35 per cent. of the whole number), there is but little reason for the supposition that the second case contracted infection from the first. But if cancer is altogether independent of environment, it is a somewhat remarkable circumstance that the 892 fatal cases occurring in the course of thirteen years in a district containing some 9,000 inhabited houses should not have been more equally distributed ; that so large a number as

forty-nine were second or third cases in a house previously resided in by a cancer-patient ; and that in some few instances there was a notable grouping of cases in houses lying close to or adjoining each other.

The period under review (1891-1903) is too short to permit of more than surmises on a problem presenting features of such exceptional difficulty as that of the ætiological relations of cancer. A study of the cancer-mortality statistics for a much longer period would be of interest, but is unfortunately impossible in Chelsea. In addition, more information is required as to the degrees of family relationship existing between the cases occurring in groups, the dates at which the patients became resident in the houses where they died, the length of stay in hospital where the patients died away from home, and as to other matters bearing on the social habits and customs of the affected persons. After the lapse of years this information is unattainable ; and if medical officers of health are ever to be in a position to contribute valuable sidelights on the ætiology of diseases like cancer, it will be necessary to have compulsory notification of cases, so that the histories may be traced during the lives of the patients, and their movements noted, a valuable record being in this way forthcoming when the death of the patient is registered. At present no information can be obtained until the patient is dead, and the facts then elicited are at second hand and often unreliable.

As bearing on the question of the infectivity of cancer it is of interest to note that in the Royal Hospital for Army Pensioners, Chelsea, which contains on an average about 630 male pensioners, of whom 62 per cent. are over 65 years of age and very few are under 45 years, there has been 1 death annually from cancer of persons aged 45 to 65 to every 383 inmates of that age period, as compared with 1 death annually of Chelsea residents from cancer to every 396 of the male population in Chelsea aged 45 to 65, the corresponding rates for persons over 65 years of age being 1 in 204 for the Royal Hospital, and 1 in 220 for Chelsea borough. If cancer was in any degree capable of transmission by direct personal infection, it might have been expected that in an establishment of the nature of the Royal Hospital for Army Pensioners, where so many old men are in intimate daily association, cancerous

affections would have had a larger share in the mortality of the inmates than the facts demonstrate, and that the death-rate of the pensioners from cancer would have been notably higher than amongst the general population of the borough of similar ages.

Again, it is noteworthy that no death from cancer of any of the staff of the Cancer Hospital, Fulham Road, which is situated in Chelsea, has been recorded in the 13 years under review. The Cancer Hospital has accommodation for about 100 patients and a staff of about 50 persons (females). The freedom of the staff of the Cancer Hospital from cancer is comparable with the freedom of the staff of the Brompton Hospital for Consumption from phthisis, and is of course merely indicative that cancer, like tuberculosis, does not spread from the sick to the healthy under the conditions prevailing in well-administered hospitals.

Assuming the existence of a cancer-parasite, and assuming that the grouping of cancer cases in certain localities or in certain houses is not the result of chance, such occurrences may be due (1) to the cancer-parasite finding in such places a suitable environment for its extra-corporeal existence—this, again, assuming that the parasite is a facultative parasite, which the facts seem to indicate ; (2) to the nature of the surroundings in cancer-areas and in cancer-houses tending to weaken the tissue-resistance of the individual to the activities of the parasite should the latter become implanted in his system ; or both of these methods favouring the propagation of cancer may be operative at the same time.

That Dr. Otto Schmidt's organism is the actual parasite productive of cancer still remains, however, to be definitely proved. That the grouping of cancer-cases in special houses or localities is the exception and not the rule is apparent from the facts above related in connection with Chelsea cancer-mortality no less than from the commonly received opinion as to the general independence of malignant cancerous diseases of any known aetiological factors.

Mr. Henry Morris, in the Bradshaw Lecture on "Cancer and its origin" delivered at the Royal College of Surgeons on December 9th, 1893, in his review of the theories as to cancer origin, regards the "tumour germ" theory, first advanced by

Cohnheim and subsequently modified by Senn, as being destined to be accepted as the true explanation of the genesis of malignant new-growths. In this theory tumours are held to originate from a matrix of embryonic cells, of congenital or post-natal origin, produced independently of microbic cause. The embryonic cells of congenital origin have been during foetal life cut off from their proper connections ; they remain in an undeveloped state, whilst themselves surrounded by developed tissues, and thus are "embryonic inclusions." The embryonic cells of post-natal origin are isolated epithelial buds (cancer) or connective-tissue cells (sarcoma) shut off from their proper anatomical relations and from their normal function as the result of the healing processes following upon wounds, excoriations, ulcerations of the skin and mucous membranes, &c. These matrices of embryonic tissue, whether of congenital or acquired origin, can remain for a length of time in a quiescent state and then suddenly start into active growth, causing tumours under the influence of some stimulus. Mr. Morris is of opinion that the stimulus may arise from injury of any kind or irritation of any kind, such stimulus exciting cancer-formation, both by arousing the matrix into activity and by diminishing the physiological resistance of the surrounding or adjacent tissues.

This theory supposes, then, that the stimulus which is sufficient to excite cancerous action in the matrix of embryonic cells is of a simple nature such as may arise from injury, irritation, or inflammation ; but is it not at least as probable, and equally in accordance with observed facts, that the stimulus should be of a specific nature, due to the introduction amongst the embryonic cells of a specific virus or parasite, which is itself the true exciting cause of cancer-formation, the weakened resistance of the tissues from age or injury, and even the very presence of the matrix of embryonic cells being themselves merely the necessary antecedents to the cancerous growth without which the exciting cause is inoperative ? It is even possible that the difference between the benign growth and the malignant growth is that the former is the result of simple stimulus of the embryonic cells, whilst the latter follows upon specific stimulation by a specific product.

The facts now accumulating with regard to the topographical and geographical distribution of cancer seem to point to some

parasitic origin of the disease, modified by circumstances which are not applicable or have no relation to other human diseases dependent upon microbial or protozoan parasites. It would be a pity if pronouncements emanating even from the highest practical authorities on cancer and its treatment should at this stage of the inquiry have the effect of deterring investigators from the pursuit of an extraneous cause for a disease which has some analogies at least with those of undoubted parasitic origin.



HYPNOTISM.

THE phenomena denoted by the word hypnotism, mesmerism, braidism, &c., have, since their first discovery, always had a certain fascination of their own, partly owing to the difficulty which exists in understanding the real nature of the condition, partly from the atmosphere of mystery which has grown up around them—an association sedulously fostered by the many quacks and charlatans who have found a happy hunting-ground in this province. At the present day hypnotism, as it is perhaps best called, has passed from the domain of an occult science into the calmer air of scientific investigation, and has even won its way to the position of a recognised means of medical treatment. Hence it is advisable for medical men to make themselves acquainted with the outlines at least of the subject. Indeed, we wish that there was more attention paid to the matter in our schools of medicine, in order that members of the profession might be able to correct the hazy views on the subject prevalent among the public generally, as well as to avail themselves of the assistance of this remedial measure in suitable conditions.

An interesting and important work dealing with hypnotism has recently appeared, written by Dr. Milne Bramwell,¹ to whose persevering advocacy of hypnotic treatment the honourable position which it now holds, as compared with its former discredit, is very largely due. The story of the early pioneers in the field of hypnotism as set forth in this book does not constitute a very creditable chapter in the history of medicine. Those who first introduced the matter to the notice of their professional colleagues were at once branded as quacks, and were overwhelmed with a flood of abuse and calumny, while no attempt was made by their traducers to investigate the truth or falsehood of the facts brought forward. Elliotson, who made experiments in hypnotism at University College, was compelled to resign his position on the staff, and the Dean "in advising him to desist (from his experimental investigations) urged that

¹ *Hypnotism: its History, Practice, and Theory.* By J. Milne Bramwell, M.B., C.M. London: Grant Richards. 1903. Price 18s. nett.

the interests of the school ought to be considered rather than those of science and humanity, and that the loss of public favour was of more importance than the truth of the wonderful facts alleged, or of their benefit in the treatment of disease." We see in this an illustration of the disadvantages inseparable from the present dependence of our great hospitals upon the charity of a fickle public, who have to be conciliated even at the expense of a loss of valuable knowledge and of relief of actual suffering. This is a condition of things which we still have to lament, as in the case of the late disreputable attack upon the hospitals, conducted by the anti-vivisectionists, with the idea of diverting the flow of charitable contributions from those institutions which allow experiments on living animals to be carried on in their medical schools. Apart from this, it is legitimate to hope that a more scientific spirit now prevails in our hospitals than in Elliotson's time, and that scientific facts can now be investigated without an admixture of popular prejudice, even if they are novel and at first sight improbable.

As to the real nature of the phenomena of hypnosis, we are even now almost wholly in the dark. The early beliefs of the mesmerists, as to the peculiar efficacy of certain metals, magnets, &c., in inducing hypnosis, are definitely abandoned, and the importance of suggestion as a factor is well recognised ; but of the nature of the mental state produced little or nothing is known. It is easy to see in it a resemblance to the equally obscure condition, hysteria, but no light is thus thrown on either state. Indeed, so long as we remain in almost entire ignorance as to the nature of normal mental activity, it is scarcely possible to conceive that we can understand abnormal manifestations of consciousness.

The most salient feature in hypnotism is the concentration of the subject's attention on one point to the exclusion of all other matters. That under circumstances of great emotion we may become oblivious to all but one idea, is seen in the fact that soldiers in the excitement of battle may receive even serious wounds without being conscious of pain ; perhaps in hypnosis an artificial stimulation of some part of the brain is produced, with resulting depression of the activity of the rest, so that stimuli coming from any but the one source

are not transmitted from the periphery, or are not passed along from one neurone to another in the central nervous system. The neurones of one system may be placed in close connection, while all others are separated and thrown out of circuit. But speculation on matters so obscure is of little profit.

The practical employment of hypnotism lies in two directions. On the one hand, anaesthesia sufficient for even severe surgical operations can be induced without any of the risks inseparable from the use of chemical anaesthetics. On the other hand, many medical ailments may be cured or relieved by suggestion. For a complete account of these conditions reference may be made to Dr. Bramwell's book. Naturally they are chiefly of a nervous type—hysterical, neurasthenic, &c. Among these we may include some instances of benefit derived by sufferers from digestive and menstrual derangements; and the possible nervous origin of some cases of eczema is enforced by a case, recorded by Dr. Bramwell, in which a cure of this malady was effected.

Two great prejudices have always acted as deterrents against submitting self or patients to hypnotic treatment. The first is the erroneous belief that a capacity for being hypnotised is a sign of weakness of mind or even of actual mental defect. The exact opposite appears to be the case: insane and highly hysterical subjects are difficult to hypnotise, while the faculty for concentrating the attention, characteristic of intellectual ability, is a most important aid in the production of the condition. The second great prejudice lies in the fear that the subject may become so subservient to the will of the operator that he or she will be placed wholly in the latter's power, and be compelled to perform any action, however repulsive or even criminal, at his orders. This feeling has been fostered by foolish exhibitions given by charlatans before popular audiences. It is clear from Dr. Bramwell's book that, in at least the large majority of instances, the subject possesses, while hypnotised, plenty of will-power to resist unpleasant or immoral suggestions. Indeed, in some cases quoted, an exaggerated sense of modesty seems to have existed in the hypnotic state without any suggestion made in this direction, the subject (a woman) refusing for example, to allow her chest to be medically examined

although she had no such unreasonable objection in the "waking" state.

In conclusion, we would cordially recommend Dr. Bramwell's book to all who are interested in the subject of hypnotism either professionally or merely scientifically. It is written in a strictly scientific spirit ; no exaggerated claims are made for his speciality, nor are facts put forward in a startling manner to attract the curious reader. It constitutes a valuable account of a branch of psychology possessing a distinct medical interest, apart from the light which it may one day shed upon difficult problems in mental activity.

W. C. B.



Reviews of Books.

Surgery; its Theory and Practice. By WILLIAM JOHNSON WALSHAM, F.R.C.S., M.B., C.M. Aberd.; Surgeon, and formerly Lecturer on Surgery and on Anatomy, St. Bartholomew's Hospital, &c. Eighth Edition by WALTER G. SPENCER, M.S., M.B. Lond.; F.R.C.S. Eng.; Surgeon to the Westminster Hospital. 1227 pages; 622 illustrations, including 20 skiagraphic plates. London: J. and A. Churchill. Price 18s. nett.

IT is with pathetic interest that we sit down to review this work, as scarcely had it been issued from the press before the news of Mr. Walsham's all too early demise followed. It is true that in this edition the bulk of the work had fallen on the shoulders of Mr. Spencer, but we may be certain that Mr. Walsham had his share in suggesting and advising, and we may doubtless consider this his last literary effort. Had Mr. Walsham no other claim upon the medical profession than the production of this work, which has run through so many editions, and concerning which he proudly mentions in the preface that not less than 38,000 copies have been issued, he would certainly have established a right to grateful remembrance; but one cannot look through the more practical portions of the work without realising that he possessed an original and thoughtful mind, which could devise suitable means of dealing with the less straightforward conditions, and that his grasp of surgical technique was extensive and thorough. He leaves a gap which it will be difficult to fill, and although the mantle of this work has already fallen on other shoulders, yet there is not about these successors the glamour of successful literary production that has surrounded Walsham. This eighth edition, for which Mr. Spencer is mainly responsible, is a great advance both in size and merit on those which have preceded it. Considerable modifications have been made, both in arrangement of material and in the treatment of different subjects, which bring it more into line with other

somewhat larger text-books ; but still there is a tendency to undue compression, which must exist if all the special departments of surgical work are to be represented. We fear that practitioners would not derive much benefit from a study of it, although students may find a sufficiency of information for purposes of "pass" examinations. The illustrations have been much improved, but there are still not a few which might with advantage be weeded out, and which give a totally incorrect impression as to the characters of certain pathological conditions, *e.g.*, those representing adenoids, as also those of the operative treatment of hare-lip.

The Elements of Pathological Anatomy and Histology. By WALTER SYDNEY LAZARUS-BARLOW, M.D., B.A., B.C. (Camb.), F.R.C.P. (Lond.), Pathologist and Lecturer on Pathology to the Westminster Hospital. London : J. and A. Churchill. Pp. 705.

"IN placing this text-book before the elementary student I have tried to give him rather an insight into main types of pathological change than a description of numerous sub-varieties. This I have done in the belief that the teaching of principles governing variations is of more use, especially in pathology, than the teaching of the names and appearances of numerous sub-varieties themselves." With this opinion which Dr. Lazarus-Barlow expresses in the preface to his book most teachers of pathology of the present day will agree. Up to quite recent times, however, the teaching of the subject in this country had, as a rule, the effect of leaving on the mind of the student an impression that practice in the "spotting" of morbid changes, either with the naked eye or under the microscope, was the beginning and end of his studies in pathology. Under existing conditions Pathological Anatomy and Histology have been relegated to their proper position as preliminary studies, necessary for the acquirement of a knowledge of Pathology as a science, and essential as a foundation on which investigations in pathology, whether in the direction of chemical, bacteriological, or what one may term physiological research, are to be based. This change in method of teaching has, so far as we are concerned in this country, had a somewhat inhibitory effect on the publication

of really sound text-books on pathology—books such as a teacher of the modern school of thought could recommend to his class without feeling that his own teaching and that of the text-book would not infrequently clash. This difficulty is due to the fact that the older school of teachers in the Metropolis were for the most part physicians in active practice, who were unable to keep within touching-distance of the rapidly accumulating mass of scientific knowledge, whilst those who teach to-day have during the period of transition been too busily occupied in learning themselves, or in carrying out work of investigation, to enable them to spare the time necessary for the crystallisation of the teaching of modern pathology in the form of text-books.

The first work in which cognisance was taken of the altered state of things was the *Manual of General Pathology* by Dr. Payne, published in 1888. In his preface Dr. Payne wrote, "It would have been satisfactory to be able to say that the arrangement of subjects in this book is in accordance with the teaching of pathology in the London schools of Medicine or in British Universities." It was, in fact, considerably in advance of the current teaching. Dr. Payne went on to say "that an undue, or at least a too exclusive importance has been attached to the form of cells can hardly be denied, and is admitted by the reaction which has set in"; and in his book Dr. Payne further claimed that "an attempt has been made to do justice partially at least to another marked feature of modern pathology, the increased importance attached to aetiology." Whilst Dr. Payne is a conspicuous example of a scientific pathologist who has passed easily through a period of transition marked by rapid advance, Dr. Lazarus-Barlow was the first of those who have had the advantage of the teachings of modern pathology from the beginning to publish a text-book of pathology which was abreast with the advance of pathological science in this country, and his *Manual of General or Experimental Pathology* may be looked upon as the first-fruits of a new epoch in British Pathology. The success of that work, together with the reputation which Dr. Lazarus-Barlow has established as a teacher of pathology and as an original investigator, render any detailed criticism of the present *Elements of Pathological Anatomy and Histology* unnecessary; it may be taken for

granted that the information given is accurate, and that the teaching is that of the modern school.

The matter is dealt with in two parts : the first relates to General Pathological Anatomy and Histology, the second to the Pathological Anatomy and Histology of Special Organs. In the former part a clear description is given of the various degenerations and other general changes, including a good account of the characters of new growths. In connection with these last it may be noted that Dr. Lazarus-Barlow is not inclined to accept the explanation of the causation of carcinoma which is at present fashionable. As to the assumed resemblance between the clinical histories of sarcoma and carcinoma, so far as the generalisation of the tumours and resemblance to the generalisation of tuberculosis or any other infective disease are concerned, a little careful consideration of the two classes of case is alone necessary to convince one that the resemblance is merely superficial and not real. In the case of the carcinomata, therefore, it must be confessed that the parasitic theory rests on a very slender foundation. In the second part of the book Dr. Lazarus-Barlow describes *seriatim* the principal changes produced in individual organs by the morbid processes which have been described generally in the first part,—a method of dealing with the subject which will meet with much approval. The book is freely illustrated, and the selection of microscopic specimens for portrayal has been carried out with judgment ; one or two of the drawings of such objects, however, hardly come up to the level of excellence which characterises the majority. The drawings of microscopic sections are extremely good throughout ; they faithfully reproduce for the student the appearances which he will see when looking down his microscope, and are not touched up with the view of making them semi-diagrammatic.

In conclusion we can only say that the present Manual is a worthy product of the pathological work of this country, and that it cannot fail to attain a popularity for teaching-purposes which will be at least equal to that of Dr. Lazarus-Barlow's former work, appealing as this one does to a somewhat larger circle of readers who will be satisfied with a somewhat less advanced book than the *Manual of General Pathology*.

A Text-Book of Pathology and Pathological Anatomy. By HANS SCHMAUS, M.D. Translated from the Sixth German Edition by A. E. THAYER, M.D. Edited with additions by JAMES EWING, M.D. 351 engravings, including 35 coloured inset plates. Pp. 602. London : Henry Kimpton. Price 21s. nett.

THIS work is admirably adapted for the student of average ability, as it is extremely clear and dogmatic, and most profusely and beautifully illustrated. It is a translation of a successful German text-book, but Dr. Thayer has done his work so well that the reader is quite unconscious from the construction of the text that this is the case. The work is divided into two parts : the first deals with general processes such as degenerations, inflammation, tumours, congenital anomalies, parasites, and disorders of circulation and of function ; while the second and larger portion is devoted to a systematic consideration of the morbid anatomy of the various organs of the body. As an example of the lucid style the definition of carcinoma may be quoted—"A malignant growth of epithelium which transgresses the physiological boundaries of this tissue and attacks organs destructively." As has already been hinted, this book is not adapted for the advanced student who looks for theoretical discussions and bibliographies, but it is an ideal book for a beginner who wishes to acquire a sound general knowledge of the subject, and as such it can be confidently recommended.

Tumours, Innocent and Malignant. By T. BLAND-SUTTON, Surgeon to the Chelsea Hospital for Women ; Assistant Surgeon, Middlesex Hospital. London, Paris, New York and Melbourne : Cassell & Co., Ltd. 3rd edition.

THE fact that the third edition of this work has been published only two years after the second edition clearly shows its value and the high repute in which it is held. The previous editions are so well known and have been so highly approved of that the third edition calls for very little comment. The classification, with one exception, is unaltered. The author has deemed it right to create a new genus, containing a single species, myeloma. He has thus, to use his own words, rescued the

myeloid tumours of bone from the banal society of sarcomata. Mr. Sutton has not as yet completely joined hands with the German pathologists as to the origin of the so-called mixed tumours of the salivary glands. The latter observers regard these tumours as of endothelial origin, and this view is steadily gaining ground in England. Our author, however, with his usual care and forethought and his strong aversion to jumping to new conclusions, thinks that we are hardly in a position to state this definitely without more work being done in this direction. Various additions have been made. Particularly, we note, further very interesting observations on uterine fibroids. On this subject the author's experience is almost unique, and any additional information from him is necessarily of special value. The causes of tumours are not discussed. To quote the preface "they still remain unknown." The truth of this statement will be generally admitted. We would rather, however, that Mr. Sutton had briefly pointed out the various directions in which pathologists have worked to endeavour to ascertain this important point. Whilst we in no way wish to speak of the book in any terms but those of the highest praise, we must confess to feeling a little disappointed because of this omission, and hardly consider a work on "tumours" complete without some reference to the theories of their ætiology.

Cancer : its Causation and its Curability without Operation.

By ROBERT BELL, M.D. (Glas.), F.R.P.S., &c., Consulting Physician to the Glasgow Hospital for Women. London : Baillière, Tindall and Cox.

THE author of this book is of the opinion that out of the twenty-six thousand and thirty-five deaths from cancer which occurred during the year 1900, at least 90 per cent. "might possibly have been avoided ;" and he thinks that, if cancer "is ever to occupy a place upon the list of curable diseases, the public must of necessity be taken into our confidence, and be educated up to the point where they will be enabled to recognise not only the disease in its initial stage, but the conditions of life which lead up to its development." Dr. Bell confesses that his chief aim is to elucidate "the pathogenesis, the pathology, and the treatment of cancer from the medical,

as opposed to the surgical point of view." He then proceeds to take the public into his confidence, and incidentally is compelled from time to time to express a very friendly opinion of his own capabilities, while in the interests of the public he has to call attention to the shortcomings of other medical men both as regards diagnosis and treatment. Still, so confident is he in the sense of his own rectitude that he is able, metaphorically, to lay his hand on his heart and say to the public "I do not fear that my readers will charge me with dishonesty or arrogance if I insist that I claim priority with regard to the pathogenesis, pathology and treatment which I set forth." For the public generally, the author's assurance as to priority will probably suffice ; whilst the medical reader will be far from disputing the claim for originality with regard to many of the statements on pathology. Dr. Bell is, so far as we know, certainly the originator of the theory that carcinoma of the breast is caused by the passage along some mysterious lymph-path, between the breast and the ovary, of cells from the latter which possess "peculiarly active instincts." The following, too, appears to be original : "My conviction is, that it is the presence of *Saccharomyces hominis* which, to a considerable extent, are concerned in the production of uric acid." Once more ; Dr. Bell has an "impression" that "myomata of the uterus have their origin in a blood-clot."

Dr. Bell's originality is not confined to his views on pathology ; he also has ideas of his own on other matters, unless, indeed, the numerous errors in spelling are merely due to carelessness. Thus we read "*fons et origo malis*," and there are numerous instances of misspelling of names—"Weichelbaum" for "Weichselbaum," "Layden" for "Leyden," "Schutter" for "Schueller." But these are, after all, minor matters, and we would have hesitated to mention them were it not that we feel that the book should have received further revision. Indeed, if the period of revision had been sufficiently long to defer publication until the Greek Kalends we do not think that any injury would have accrued either to medical science or to Dr. Bell's reputation. Nor do we think that the present appearance of the book is likely to have the least effect in diminishing the mortality from cancer. The treatment by thyroid extract, which is mainly referred to, has been repeatedly

tried, and is still being employed, by numerous medical men, and it is doubtful whether we have yet arrived at a just estimate of its value. But in any case, the details which Dr. Bell publishes of cases which he claims to have cured are insufficient to enable the medical reader to form any opinion. The book, in short, is, as Dr. Bell says, intended for the public, and if they derive any edification from it the object of the author will at any rate have been partly fulfilled.

Cliniques Médicales Iconographiques. By MM. HAUSHALTER, G. ETIENNE, and L. SPILLMANN, Agrégés à la Faculté de Nancy, and CH. THIRY, Ancien Interne des Hôpitaux de Nancy. 382 pages ; 62 plates, including 398 figures. Paris : C. Naud, Éditeur.

IN this magnificent tome are gathered together a selection of the photographs taken during the course of many years in the hospital services at Nancy. They have been arranged in groups, so as to represent various morbid conditions, such as the attitude in nervous diseases (*e.g.*, amyotrophic paralysis, infantile hemiplegia, facial paralysis, peripheral neuritis, &c.). The cutaneous lesions of syphilis, tubercle, &c., are also represented, and sundry affections such as gangrene, rickets, and chronic rheumatism are also depicted. We had hoped to be able to reproduce some specimens of the illustrations in this work, but unfortunately the plates are printed in such a way that this cannot be arranged. Had we been able to do so, we should have been able to bring home to the minds of our readers the great excellence of the reproductions, but must now satisfy ourselves with verbal commendation. Certainly the illustrations are more vivid and realistic than any we have ever seen in medical works ; the hands and feet seem to stand out of the pages, and every detail of structure is most accurately reproduced. To this we must add that there is a suitably brief, but sufficient, description of the conditions represented, and that a more elaborate account of the actual cases shown is appended. We congratulate authors and publisher on the splendid result of their conjoined labours, and would heartily advise our readers, if they cannot secure the book for themselves, at any rate to look it thoroughly

through at some library. There can be no question as to the value to the profession of the fixation by photography of distinctive features of characteristic cases.

Tropical Diseases. A Manual of the Diseases of Warm Climates. By PATRICK MANSON, C.M.G., M.D., LL.D. (Aber.), F.R.C.P. (Lond.), F.R.S., Lecturer on Tropical Diseases at St. George's Hospital and Charing Cross Hospital Medical Schools, Lecturer in the London School of Tropical Medicine, &c. With 114 illustrations and 2 coloured plates. London. New and enlarged edition. Price 10s. 6d. nett.

THIS is a new and revised edition of Dr. Manson's well-known and excellent manual upon Tropical Diseases. The work retains essentially its original form, with additions and corrections necessary to bring it up to date. A new feature is a chapter, profusely illustrated, upon the mosquito. Bentley's hypothesis that Kala-azar is a manifestation of Malta fever, and recent work upon human trypanosomiasis, sleeping-sickness, the bacillus of dysentery, and the investigations of American observers upon yellow fever all receive adequate notice.

Maladies des Pays Chauds. Par PATRICK MANSON. Traduit de l'Anglais par M. GUIBAUD et J. BRENGUES. Pp. 776. 1904. Paris : C. Naud, éditeur. Prix 12 fr.

IT was only to be expected that Sir Patrick Manson's valuable book on tropical diseases would be translated into other European languages, and we welcome the appearance of this French edition. It has sometimes seemed to us that the form of the English volume did not do justice to the importance of the author's work, but in regard to the book before us this complaint cannot be made, as it constitutes a handsome volume, printed on good paper and in the best of type. In view of its size and appearance its price seems extremely moderate. The French edition contains not only the text of Manson's work, but also an appendix supplying valuable information on some subsidiary points, such as treatment of abscess of the liver, serum-therapeutics of plague, &c. We

congratulate the translators and publisher on the book which they have produced, only regretting that it has not been found possible in this edition, dated 1904, to include the additions made by Manson in the 3rd edition of his book (1903), referred to in the preceding review. Thus trypanosomiasis does not appear to be alluded to in the French work, although we should have expected to find some account of it in the appendix, if not elsewhere.

A Treatise on Massage. By DOUGLAS GRAHAM, M.D. Third edition, revised and enlarged. Pp. 462 with 63 illustrations. 4 dollars. Philadelphia and London : J. B. Lippincott Company.

THE first edition of this valuable book appeared so long ago as 1884, and in the two subsequent editions numerous additions have been made with such good judgment that the work is fully abreast of the time. It is eminently practical, and at the same time very pleasant to read. The numerous illustrations, the print, and paper are alike excellent. Every practising physician and surgeon should read it and keep it at hand for reference.

Lectures on Massage and Electricity in the Treatment of Disease. By THOMAS STRETCH DOWSE, M.D. Aberd., F.R.C.P. Ed. Fourth and revised edition. Bristol : John Wright & Co. London : Simpkin Marshall, Hamilton, Kent & Co., Ltd. Price 7s. 6d. net.

DR. STRETCH DOWSE's well-known work has entered a fourth edition, and although its 450 pages embrace so wide a field, it is thorough in every respect and constitutes an excellent textbook for those medical men—and they are a growing number—who wish to devote themselves to the application of massage and electricity, and such allied physical agents as the Finsen light-apparatus, to the treatment of disease and ill-health. The 101 illustrations are clear and well executed, and the print is good. The perusal of this work of itself is sufficient to emphasise at once the need of teaching of massage, &c. as a part of medical education, and of the importance of the control

of this branch of therapeutics remaining in medical hands. No others can properly appreciate the many uses, applications and limitations of massage and electro-therapeutics.

Our Baby. For Mothers and Nurses. By Mrs. J. LANGTON HEWIS. Bristol : J. Wright & Co. London : Simpkin Marshall, Hamilton, Kent & Co.

THIS little book, which has already reached its eighth edition, is admirable as a text-book for inexperienced mothers and nurses, and we have much pleasure in thoroughly recommending it. The book is well thought out and carefully written, and the chapters on food and dress are really excellent. We think, however, that greater stress should be laid on the fact that mothers and nurses should not prescribe any but the very simplest medicines for their babies. Thus we take exception to the chapter on "Medicines for Baby," which (among much that is excellent) we think is a mistake. When we find instructions for the administration of bromide of potassium, calomel and "Fellows' syrup," we feel that both mother and nurse will have overstepped the bounds of prudence if they play with such drugs, useful as they may be in the hands of the physician. Surely, too, in a book so up-to-date in the feeding and management of babies, it is rather a surprise to find the following advice on "vaccination":—"The surest way of vaccinating is from arm to arm ; this method very rarely fails." It should be remembered that arm-to-arm vaccination is no longer to be recommended. In other respects the book is excellent, and should be in every household where there are children.

Practical First Aid. By WM. ROBERTSON, M.D., D.P.H., Medical Officer of Health and Surgeon of Police for Leith, &c. Paisley : Alexander Gardiner.

AMONGST the many text-books on the subject of first aid this little book will take its place, not because it has anything particularly new or original, but because it is issued in an attractive form, and the illustrations are very clear. We should like to have seen all the narrow slings begun on the sound side, instead of over the same side as the injury (Figs. 27 and 38). There are some curious little errors in the physiology which should be corrected in further editions. For example (page 27),

on the subject of the pulmonary arteries and veins we read :—
“This is a confusing nomenclature, but it is due to the fact that the flow of blood in the pulmonary veins is *away* from the heart and the current in the pulmonary arteries is *towards* the heart, as it is in other veins and arteries.” Needless to say, this is exactly the reverse of the fact. The chapter on poisons is good, and contains the antidote for phosphorus, which is a want in many small handbooks. We think that no book of first aid is complete without a good index—a feature which this little volume lacks.

The Wife and Mother. A Book of First Principles for the Guidance of young Married Women. By RALPH VINCENT, M.D., M.R.C.P. Lond., M.R.C.S. Engl. London : The Walter Scott Publishing Co. Price 5s.

THIS book may be safely placed in the hands of any young married woman, and the information it contains will be found both simple and practical. At the same time it contains nothing which might lead her “to rely on book-reading instead of medical advice.” Whilst thoroughly endorsing all that Dr. Vincent says about massage after labour, and the necessity for caution connected therewith, we cannot agree with him with respect to the “Skintight” binder of “unyielding material,” with its “12 wide straps and buckles.” In our opinion a well-applied ordinary binder answers the purpose exceedingly well (*i.e.*, the comfort and support of the woman, which is all a binder can lay claim to). Moreover, such a binder can be easily boiled and constantly changed, which would not be the case with one with buckles and straps. Again, the stress laid on the importance of daily weighing an infant is a mistake in our opinion. The conscientious and careful weighing of the child once a week is important and sufficient. Lastly, the chapter on artificial feeding is too theoretical and its methods too complicated for the inexperienced mother ; and while, no doubt, the “modified milk” for a very delicate infant is an excellent preparation, for an ordinary healthy infant simplicity in method and cleanliness in detail is the thing to be aimed at. The book will no doubt be read with interest by many young married women, who will find many hints of value and help to them.

The Story of Life. For the use of Mothers of Boys. By ELICE HOPKINS. Author of "The Power of Womanhood ; or Mothers and Sons," &c., &c. London and Newcastle-on-Tyne : The Walter Scott Publishing Co. Price 1s.

WE have read with pleasure this little book and we wish it well. It is written with a purpose and very well done. The subject of sex is discussed, free from all prudishness and with a very reverent mind. We do not suppose it will be read by boys just leaving home for school (we are not sure that they would understand it if they did read it), but we think that any mother who had carefully read the book would feel herself better prepared to meet the questions and satisfy the curiosity of her inquisitive sons. This book is a good addition to this very useful "Everyday Help Series."

The Pharmacological Action and Therapeutic Uses of the Nitrites and Allied Compounds. By the late DANIEL JOHN LEECH, M.D., D.Sc., Professor of Materia Medica and Therapeutics in the Owens College. Edited by R. B. WILD, M.D., M.Sc., &c. Pp. viii and 187. 28 plates. Manchester : Sherratt and Hughes. Price 10s. 6d.

IT is matter for sincere regret that Professor Leech had so little opportunity of adding to the stock of literature dealing with Materia Medica and Therapeutics. The demands upon his time as a consultant, as a man of affairs in the general, as well as the medical, work of several Manchester hospitals, as a professor intensely interested in the welfare of his students, and, during his later years, as chairman of the Pharmacopœia Committee of the General Medical Council, left but little leisure for literary composition and still less leisure for original research. Notwithstanding his multifarious labours he succeeded in compiling much material for a comprehensive bibliography of Materia Medica, of which a selection is given in the volume under notice. It appears that it was his intention to republish in book form his Croonian Lectures on the Nitrites, with additional matter and illustrations. This, however, his early death prevented, and it has therefore been undertaken by Professor Wild, who has availed himself of a copy of the lectures which Dr. Leech himself had revised, so that the

views expressed are actually those held by the author in 1900, notwithstanding that the lectures were delivered in 1893. Those of our readers who have read the article on the Nitrites contributed by Dr. Leech to Dr. Hale White's *Text-book of Pharmacology and Therapeutics* will be glad to possess the figures, numbering 153, in the present volume, which so amply elucidate the pharmacology of this important group of remedies. The volume also contains several other articles on the Nitrites, including one reprinted from THE PRACTITIONER. In some sense this is a memorial volume ; but it is something much more than that. In addition to the valuable information which it contains with reference to the drugs of which it treats, it is a revelation of the thought and work of one who was thoroughly imbued with the true scientific spirit, of one whose dominant idea was to know the truth. The task of editing this book has been carried out with great care ; in fact, the only slip of any kind which we have detected is the misspelling of Pereira's name, which appears as Pareira.



Notes by the Way.

The Regius Professorship of Medicine in Oxford.

As we go to press, no appointment to the Regius Professorship in Oxford has been announced. The questions centering round the present vacancy have given rise to a good deal of divergence of opinion. The rumours to which we alluded in our January number have been amply confirmed, and there is no longer any concealment as to the attempt on the part of certain teachers in the University to inaugurate a complete change in the position of the Regius Professor. According to this view of the necessities of the case, the Regius Professor is a useless luxury—a drone whom it is desirable to replace by an active teacher of some special science. The share of honey, in the shape of emoluments, which falls to the occupant of the Chair is not large, but it would form a convenient addition to the scanty endowment available for Pathology. This view unfortunately ignores the fact that, although it is possible for an incompetent Professor to do little useful work, there are important functions which an energetic head of the Medical School might perform. There can be little doubt that in a body of representatives of a large number of different sciences, such as directs the Oxford Medical School, there is need of a central coördinating influence which shall prevent undue claims being enforced by any one speciality, and ensure a unity of design in the arrangement of the medical course pursued by students, with a view to the attainment of the greatest practical good. It is to the Regius Professor that we must look to exercise this power, and in order that he may be able to do so, he must not only be a representative of the clinical as well as of the scientific side of medicine, but he must be free from bias towards any one component part of the curriculum. Hence the attempt practically to abolish the Regius Professor of Medicine, and to substitute a Professor of Pathology, has met with strong, and we think just, opposition. Even if the principle underlying the Oxford proposal were free from objection, it would be needful to protest against the

attempt to carry it through, without any opportunity for discussion, by the fiat of an outside authority. We have, however, confidence that both sides of the question have now been laid before the Prime Minister, and that there no longer exists any fear that the change will be rushed through without due consideration.

* * * * *

Our Workhouses. THE fear and dislike with which the poor regard the workhouse may at times appear to be an unreasonable prejudice, when we think only of the comparative comfort in which the inmates live, contrasted in many cases with a previous life of semi-starvation. But an article in the December number of *The Nineteenth Century and After*¹ sheds a lurid light on the reverse side of the picture, and goes far to explain the existence of such a feeling, and indeed to justify it. We are here told of instances in which the sane and the insane are herded together indiscriminately; of a poor old woman who had for her sole companion, day after day, a hopeless imbecile, and ruefully complained that from morning to evening she never heard a word of sense; of a workhouse in which two reprieved murderers were left to associate on equal terms with the other inmates, the horror being heightened by the presence of a degraded idiot. In another case the workhouse buildings were quite unfit for human habitation, but in spite of remonstrances from the Local Government Board nothing was done to remedy the defects, and apparently the central authority had no power to insist on improvement. We pride ourselves on the removal of the gross abuses which once existed in the management of our gaols and asylums. Yet if the statements contained in this article are true, a scarcely less abominable system prevails in many of our workhouses, in which, unlike a prison, there are contained many who have led blameless lives and only fallen on evil days through unavoidable misfortune. It is the duty of the country to see that the abuses set forth in the article to which we have alluded are removed, and that steps are taken to render the occurrence of such things impossible. The sane

¹ "Shifting Scenes in Rural Workhouses." By Edith Sellers. *The Nineteenth Century and After*, December, 1903, p. 1000.

and the insane or imbecile should be rigorously separated. Mentally-defective persons should be sent to proper asylums, not to workhouses, except perhaps in the very mildest cases ; and some steps should be taken to avoid the necessity for the deserving poor to associate with criminals and ne'er-do-weels of all kinds.

* * * * *

Ankylostomiasis. THE disease caused by the parasitic worm, *Ankylostomum duodenale*, has until recently always been looked upon as a malady of foreign countries in which we had little immediate interest. The investigations carried out by Dr. Haldane and Dr. Boycott, revealing the existence of this parasite in the Dalcoath mine in Cornwall, have now shown that it is capable of existing in this country. The ravages caused by the worm among the labourers in the St. Gothard tunnel are well known. In other instances it is chiefly miners who are affected. It seems that the conditions necessary for the transference of the parasite from one individual to another are the existence of warmth and moisture in the soil, which becomes contaminated with the infected dejecta. These conditions are fulfilled in mines, in which, moreover, it is difficult to ensure cleanly habits among the workers. It is much to be hoped that the careful investigations carried out by Drs. Haldane and Boycott, and the attention thus attracted to the subject, may be successful in putting an end to the infection in its present habitat, and that no further spread may take place.

* * * * *

Perils in Milk. IT is now well known that many diseases may be conveyed by means of milk, this substance affording a suitable pabulum for the majority of pathogenic organisms. In our special number last month we alluded to the question of the conveyance of enteric fever by this channel, and the possibility of a milk-spread epidemic of diphtheria or scarlatina is universally accepted. Hence it is of the most vital importance to the community that the greatest care should be exercised in safe-guarding the purity of its milk, and the attention of Medical Officers of Health cannot be too strongly directed to this task. We therefore cordially welcome the appearance of a very complete and valuable account of the

Bacteriology of Milk¹ which has recently appeared, written by Drs. Swithinbank and Newman. In this handsome and well-illustrated volume all that there is to be known on the subject of the germs that affect milk may be found; and the information will be useful not only to bacteriologists and sanitarians on the hunt for morbific microbes, but may be commended to the notice of dairy-farmers of a scientific frame of mind who may find themselves troubled by such conditions as "bitter milk," detracting from the saleability of their produce. We do not advise "the merely curious," as they are termed by the advertisers of attractive novelties, to dip into this book, lest they should be appalled by the list of germs which may luxuriate in the domestic milk-can. But scientific students of sanitary problems will find it a storehouse of information, both practical and theoretical.

* * * * *

**"Cancer-
Combatants."**

WE have received from Dr. Brand a letter, which will be found on another page, complaining that in our comments upon his article dealing with the causation of cancer, which appeared in our November number, we were guilty of misrepresenting his arguments and contentions. We confess that we regarded Dr. Brand as an opponent in the matter, since his paper was admittedly a reply to some notes of our own in an earlier number, and for that reason we dealt unusually severely with his paper. We did not, however, intentionally distort anything that he said; but in paraphrasing an opponent's words for the sake of analysing their meaning it is difficult to avoid the charge of misrepresentation. If we have unwittingly been guilty of such we unhesitatingly tender our apologies to Dr. Brand, although even in the light of his present letter we do not feel that the charge is brought home to us. The matter is too important for anyone to wish to gain mere dialectical triumphs; but it is necessary to apply the strictest canons of logic to the arguments brought forward to support or refute theories dealing with matters on which there is little really sure evidence one way or the other. We need hardly point out that the syllogism (deduction) is of very limited use in scientific investigation.

* * * * *

¹ *The Bacteriology of Milk.* By Harold Swithinbank and George Newman
London : George Murray. Price 25s. nett.

**The Infectivity of
Cancer and its
Serum-treatment.**

IN his article, which appears in our present number, Dr. Louis Parkes reviews the evidence afforded by a study of the deaths from cancer in the borough of Chelsea as it bears on the question of the infectivity of the disease. As a result he is constrained to admit that no very definite evidence of transference from person to person is forthcoming. Yet Dr. Parkes still leans to the view that cancer is due to a parasite; and we fully agree with him that no slackening in the search for such a causal agent should take place at present, in spite of the repeated disappointments which enthusiastic investigators have experienced. The account which has recently been given of Dr. Schmidt's investigations, and of the results obtained by the use of the anti-cancerous serum which he has prepared, does not seem to us very convincing, either as to the causality of the parasite or as to the efficacy of the remedy. Many serums have been announced as cures for this disease, and nothing is more curious than the uniformity with which good results are recorded at first with each new remedy. Yet no serum has yet stood the test of experience, when it has been submitted to trial by others besides its inventor. Two main varieties of serums have been prepared. On the one hand, animals have been inoculated with organisms derived from malignant growths, in the hope that these organisms might be the causal agents at work, and that an antagonistic serum might thus be procured. On the other hand, the actual cells of tumours have been employed for the purpose of injection, in order to prepare a "cytolytic" serum which should act destructively on the cells of new growths. We can only hope that Dr. Schmidt's preparation may prove more effectual than its many predecessors, when tried on patients suffering from cancer. A case recently recorded in which it had been tried did not exhibit at the necropsy any distinct traces of local remedial action on the tumour.

* * * * *

**The Art of
Prescribing.**

IT is often said that prescribing is rapidly becoming a lost art, partly owing to the fact that little attention is generally paid by students to the subject—and it is impossible that they should

attend to everything of importance, in view of the mass of useless information with which they are compelled by the present regulations to burden their memories—partly to the temptation which exists to make use of the many preparations thrust upon us by the manufacturing chemists, rather than take the trouble to think out the best combination of drugs for each particular patient. Yet it is not difficult to realise that too ready a recourse to the fascinating tablets and capsules which are scattered in our path may not always coincide with a policy of "enlightened self-interest," any more than with the duty which we owe to our patients. It is so easy for the latter to continue ordering from the druggist the elegant little pellets or the seductive draughts which we have too lazily ordered, without the need for paying further visits or fees to the medical attendant. And this is what often happens. Apart from this, the art of prescribing is certainly neglected in our medical schools, where it is generally the fashion for physicians to order some stock mixture rejoicing in an abbreviated title, so that students do not realise the actual ingredients which are being taken by the patient. The Latin language too, is a difficulty in these days. For the benefit of those who, like the future graduates of the London University, may be held, in default of evidence to the contrary, to be ignorant of this tongue, a little book has been produced by Dr. Burnet,¹ of Edinburgh, which sets forth just that amount of Latin which is necessary for purposes of prescribing. It is unfortunately impossible to doubt that there are not a few members of our learned profession who will appreciate this aid, and to their attention we would commend the book. We notice that the vexed question as to whether the vehicle which completes the amount of the dose should be put in the accusative or the genitive case ("Aquam," or "Aquæ ad Unciam") is not decided by Dr. Burnet, who employs now one, now the other case in his formulæ.

¹ *Hints on Prescription-writing.* By James Burnet, M.A., M.B., M.R.C.P. (Edin.). Edinburgh : E. and S. Livingstone. Price 1s. nett.



Novelties and Notices.

CASE-BOOK FOR PRIVATE NURSING.

The Scientific Press, Limited, have issued a small book, in copy-book shape, containing useful forms for the reports written by both day and night nurses upon cases under their care in private practice. A book of 48 forms, lasting therefore 24 days, may be had for 3d. We can commend these publications to nurses in need of such note-books. Temperature-charts are not included, but there are spaces for notes on the bowels, urine, nourishment taken, &c. suitable for showing to the doctor at his visits.

HÆMATOGEN.

Hommel's Hæmatogen has now definitely taken its place as a valuable form of iron tonic, which may be specially useful in cases in which inorganic salts of the metal are not tolerated by the stomach. It consists of a solution of haemoglobin in an appropriate vehicle. Some alterations have recently been made in the flavouring agent employed which constitute a distinct advance. Its good effects in many forms of anaemia and debility are undoubted, and it is readily taken by children. Hæmatogen possesses the special advantage that it does not cause digestive disturbance or constipation. The dose for an adult is a tablespoonful twice a day, while infants may take half a teaspoonful or more in milk.

ALLENBURY'S MILK-FOOD CHOCOLATE.

Messrs. Allen and Hanbury have conceived the excellent idea of combining their well-known "Allenbury" food with chocolate, so as to add to the nourishing properties of the latter. The combination is of excellent flavour, resembling that of milk-chocolate; and we can cordially recommend our readers to make trial of the product. It is sold in cakes, costing either 6d. or 3d. each, according to size, contained in boxes of one and two dozen respectively. We know of no better form of concentrated nourishment for travellers, &c.

TABLOID HYDRARG. PERCHLOR. ET POTASS. IOD.

The advantage of having in tabloid form drugs such as mercury and iodide of potassium, which have often to be taken for long periods of time together, is obvious. Messrs. Burroughs, Wellcome & Co. have now added to their list of tabloids one containing Hydrarg. Perchlor., gr. $\frac{1}{2}$, and Pot. Iod., gr. $2\frac{1}{2}$. These will be found useful in the case of patients who do not need, or cannot tolerate, the larger doses contained in the tabloids of double the strength already manufactured by this enterprising firm.

TRISCUIT AND SHREDDED WHEAT.

These two preparations, sold by the Natural Food Company (44, St. George's House, Eastcheap, E.C.), are very similar in nature. They consist of "whole wheat" prepared by a special process in the shape of crisp threads matted together. In the course of preparation, not only are all the constituents of the wheat embodied for use, but the material is rendered more than usually digestible, the result being products which are highly nutritious and at the same time suitable for even delicate stomachs. By a little culinary skill very appetising dishes may be made from these preparations, or they may be eaten as they stand with cheese and butter, or simply soaked in milk.

CADBURY'S CHOCOLATE.

Messrs. Cadbury's chocolates have so securely established themselves in popular favour that they need no recommendation by us. We have received from this well-known firm specimens of their Mexican Chocolate, Chocolate Pastilles, Milk Chocolate, and Chocolate Wafers, and also of their Cocoa Essence. Of the former preparations we can safely say that their purity and careful manufacture render them not only very delectable sweetmeats, but also valuable food-materials. The cocoa is also excellent, and has the advantage that being practically unsweetened, it can be taken with exactly that amount of sugar which suits each palate. It forms a wholesome and pleasant beverage, suitable to those whose digestion cannot tolerate tea or coffee ; and, unlike these drinks, it contains an appreciable amount of nourishment as well as liquid and stimulant.

BOYD'S BANANA MALTED FOOD.

The nutritious nature of the banana has long been known, and Stanley in his book *Darkest Africa* notes its utility in some cases of gastric derangement. The preparation before us, sold by the Medical and General Specialities Company (300, Clapham Road, S.W.), is made from this fruit along with other cereals and milk-proteids. The food, which is in the form of a powder, has a pleasant smell of bananas, and contains all the principal substances necessary for the support of life, being rich in phosphates and albuminoids. It may be welcomed as an addition to our stock of invalid specialities, since its malted character renders it easily digestible ; and it should be readily taken by children of a suitable age.

FUSSELL'S STERILISED CREAM.

This substance is stated to be prepared in Norway, and to consist of pure cream sterilised by a special process without the addition of any chemical antiseptics. It is pleasant in taste, without that bitterness which is sometimes noticeable in cream to which some preservative has been added. Fussell's cream is sold in tins, hermetically sealed, costing 6d., 9d., and 1s. according to size. It may also be obtained in gallon and half-gallon vessels. It should be useful to travellers, and to residents in hot countries, as it is said to keep good indefinitely.

BRAND'S FEVER-FOOD.

This elegant preparation, manufactured by Messrs. Brand & Co., the makers of the well-known Essence of Beef, consists of eggs, cream, and meat-essence. In consistency it is somewhere between jelly and custard, and its pleasant flavour should render it an agreeable form of nutriment to invalids, such as febrile patients, who cannot take solid food. Of its nourishing value there can be no question. It is sold in tins, hermetically sealed, but opened easily by a key attached to each ; the price per tin being 1s. 4d.

Practical Notes.

THEOBROMINE IN CARDIAC CASES.—The use of theobromine as a hypnotic, as well as a diuretic, was first advocated by Drs. Gallavardin and Péhu (*Lyon Médical*, November 1903). Its employment in cardiac cases and patients suffering from arteriosclerosis was found by them to be of great value. Huchard confirms this view, but attributes the hypnotic effects, not to any direct action of the drug, but to its activity in clearing out of the system poisonous metabolic products, to the presence of which sleeplessness may be due. The drug may be given in cachets containing 0·5 grm. (about 7½ grains), and the dose per diem should be from 1·50 grm. (about 24 grains) to double this amount as the outside dose allowable. Theobromine is an expensive substance, and care must be taken to avoid substitution or adulteration. A useful mixture for gouty and arteriosclerotic patients consists of equal parts of theobromine, carbonate of lithium, and benzoate of sodium. Three grains of each may be given in a cachet for a single dose. In some cases in which a tonic and stimulant action is needed in addition to the diuretic effects of theobromine, this drug may be administered along with caffeine. If the theobromine causes digestive disturbance, this may often be prevented by the addition of a small dose (4 grains) of neutral phosphate of soda. (*Journal des Praticiens*.)

PERMANGANATE OF POTASSIUM AS A DRESSING.—Carles (*Jour. de Méd. de Bordeaux*) speaks highly of a 1 in 1,000 solution of permanganate of potash for purposes of dressing wounds of all kinds. The solution may be used for washing infected or clean wounds, for injection into septic cavities, or for moistening compresses applied to the seat of injury. It is useful for chronic sores, such as ulcers of the leg or tubercular sinuses, and a clean granulating surface seems to be rapidly produced under such treatment. No pain is caused, nor are cutaneous lesions produced, as by some forms of antiseptic

dressing ; indeed there seems to be some analgesic property in the permanganate which renders it specially applicable to burnt surfaces. The staining produced on linen or on the skin itself is unimportant, and is easily removed by means of bisulphite of soda, tartaric acid or similar substances. (*Journal de Médecine et de Chirurgie Pratiques.*)

TAPE-WORM.—Gerhard (*Medical News*, Nov. 14, 1903) gives some advice as to the treatment of tape-worm. The drugs usually employed are male fern, kousso, pomegranate and turpentine, all of which are exceedingly nauseous to take. Pumpkin-seed may be used for children, powdered and mixed with sugar. For an adult he advises as follows :—

“ There is no necessity for the patient to make several days' preparation. The loss of one meal—breakfast—is all that is required. In many cases the most convenient day to select for giving the medicine is Sunday, for the reason that most patients are at leisure at that time.

“ Instruct the patient to clear out the bowels the day previous, with one or two large doses of castor-oil or salts. One dose may be given in the morning and one at night, an hour or two after a light supper.

“ The next morning, as early as possible, say at six o'clock, give at one dose a pelleterine tannate, 20 grains, in two capsules. When this has operated freely, in about two or three hours begin with the following :—

“ R. Olei resinæ aspidii	-	-	-	-	-	3ii
Aetheris	-	-	-	-	-	3ii
Hydrargyri chloridi mitis	-	-	-	-	-	gr. xii
“ M. et. div. in capsulas No. xvi.						
“ S. Two every ten minutes.						

“ Of course it is understood that no food is taken during this time. In about two or three hours the worm will be expelled whole, with its head fastened to its neck.”

TREATMENT OF CHLOROSIS.—Gilbert (*Bulletin Médical*) discusses the treatment of this common condition. Iron in some form given by the mouth is the common remedy. If

this causes digestive disturbance, recourse may be had to hypodermic injections, and for this purpose cacodylate of iron is the best salt to use. Ferrous cacodylate may also be administered by the mouth, the ferric salt being that used subcutaneously. Care must be devoted to the feeding of these patients, all foods being avoided which can give rise to dyspepsia. Among these must be included wines, especially medicated wines. Rest is essential, and these patients should rise late and go to bed early. Plenty of fresh air is also to be prescribed, especially that of the mountains, but the seaside is to be avoided, as it does more harm than good to the chlorotic. (*Le Mois Thérapeutique.*)

NUTRIENT ENEMATA. — Writing in the *Gazette des Hôpitaux*, MM. Mathieu and Roux point out that while water and salts are readily absorbed from the rectum, and peptones also seem to be assimilated, fatty material remains behind. Rectal feeding is an unsatisfactory substitute for the ordinary mode of taking food, and should not be adopted without absolute necessity. A useful nutrient enema consists of the whole substance (white and yolk) of one or two eggs, beaten up carefully with a little cold water till no threads of albumen are left. To this are added 250 cc. of warm water and two grammes of salt for each egg used. The water in the above formula may be replaced by an equal amount of milk. The authors make no mention of any previous "peptonising" of the ingredients, as is usually done in this country.



Correspondence.

To the Editor of THE PRACTITIONER.

SIR,

IN the "Notes by the Way" of the August number of THE PRACTITIONER there are one or two statements regarding the origin of cancer that induced me to send you a communication, entitled "The Causation of Cancer," which you were good enough to publish in the October number of the journal. This article was accompanied, in the "Notes by the Way" for that month, by a trenchant and very hostile critique.

Now I do not object in the slightest degree to criticism, however severe; on the contrary, I am glad of the opportunity of an exchange of views; but my views and statements are there so entirely misinterpreted, owing probably to some nebulousness of expression or infelicity of diction on my part, that the critique amounts to actual misrepresentation, no doubt unintentional, on the part of the reviewer.

Although this may have been obvious to the bulk of the readers of the article and critique, I should, at the same time, be greatly indebted to you if you would afford me an opportunity of disclaiming the views attributed to me which are, indeed, the reverse of those which I hold and have stated.

Facts and their Interpretation.—What are designated in the October Notes as "the facts of the case" were not admitted to be such in the Notes for August, for there the terms *imitation* and *supposition* are used in connection with them, and it was to demonstrate that it is not necessary to *suppose* anything about the nature of cancerous metastases, and that these secondary growths do *not imitate* their parent tumours, that my paper was chiefly written.

I do *not* find, in the identity of structure observed between the original cancerous growth and its metastases, any argument whatever in favour of the parasitic nature of cancer, and I have nowhere said so; so that the assertion that I do is entirely false and unfounded.

On the contrary, I have explicitly stated that the transportation of the cancerous cells themselves, which give rise to the metastatic growths, is the sole point in which analogy between cancer and the germ-caused diseases fails; but that although analogy fails in this particular this is no proof that cancer is not infectious, for it is absurd to suppose that pathogenesis can be fettered by analogy.

There is nothing in this statement to justify the derisive suggestion of the movement of the earth being fettered by the multiplication table as a parallel. Besides, as you must be very well aware, it is a logical truism that analogy is entirely valueless for the purposes of proof, since, at the best, it can afford only probability.

Influence of Age.—I do not consider the occurrence of cancer in old age to be an argument in favour of the infectious hypothesis of cancer, and no statements of mine can justify the attributing of such an obviously absurd belief to me. I hold no brief for the many other believers in the infective nature of cancer, but I think I am safe in saying that not one of them holds any such belief.

I have elsewhere pointed out that, in every case of cancer, a condition precedent has existed. Of this condition precedent there are many factors such as:—Irritation occurring within or without from any cause; traumatism; chronic disease; degeneration of tissue from any cause, such as senility; obsolescence; congenital susceptibility; &c., and I simply referred to senility as a predisposing cause of great interest, and not in any way as an argument in favour of the doctrine of the exogenesis of cancer.

Infectivity of Cancer.—Under this heading the misrepresentation of my words is based upon a mutilated quotation.

The full sentence is:—No one can deny that cancer is intensely infectious to the individual, and it cannot be gainsaid that all diseases which are infectious to the individual are capable of communication to others, and are also of external origin, *therefore cancer is and must be of an infectious nature.*

In the critique the conclusion (in italics) is omitted, only the premisses being given.

Let me state my argument in the form of proper logical syllogisms :—

(1) All diseases infectious to the individual are communicable to others.

Cancer is infectious to the individual.

Therefore cancer is communicable to others.

(2) All diseases infectious to the individual have an external origin.

Cancer is infectious to the individual.

Therefore cancer has an external origin.

This is very different to what I am made to say, viz. :—" No one can doubt that cancer spreads from one part of the affected individual to another, therefore it can be communicated to other persons."

The first and principal premiss is ignored, and I am supposed to prove a conclusion by one, and that a minor, premiss, which is obviously logically absurd.

With regard to these two syllogisms it remains for anyone to disprove the premisses if possible, but as they stand they yield a logical conclusion, in each case, which is *not* a fallacy.

It is *not* begging the question to say that all diseases infectious to the individual are communicable to others ; it will be universally admitted.

It is *not* begging the question to say that cancer is intensely infectious to the individual ; it is a generally admitted fact.

Finally, it is an indisputable fact that all infectious diseases have an external origin.

Therefore my contention that cancer is communicable to others and is of external origin is *not* a fallacy, and it is a logical *sequitur*.

By "infectious to the individual" I mean the gradual evolution of disease (more or less rapid) locally and constitutionally, over the body from the point of entrance of the infective agent, as in the case of, e.g., syphilis, or (waiving the question of *infection*) from the point of origin in the case of cancer.

Diseases infectious to the individual are, of course, very numerous, being, as they are, those caused by external parasitic agency whether microphytic or microzoönal ; and I think that,

except for the sole fact that the tumour cells in cancer are themselves transported in addition to the infective particles, cancer very closely resembles in its behaviour a chronic infectious disease.

Infection, of course, differs very widely in degree (contrast small-pox and leprosy), and the infectivity of cancer is evidently not great. It has been clinically proved to be locally inoculable, and its very frequent occurrence in the alimentary tract would suggest that the infective particle has been swallowed, as is the case in enteric fever.

In conclusion, if I may be permitted to "carry the war into Africa," I would point out that my critic's contention that, supposing cancer is communicable from one individual to another, it is still necessary to prove that it is due to a parasite, is quite untenable.

I cannot imagine that anyone could be found with the necessary temerity to deny that all diseases communicable from one individual to another, and therefore infectious, are of external origin, and due to the presence of a parasite of some kind, microphyte or microzoön.

Again, the hypothesis advanced by the writer of the critique that cancer may "consist in a disorderly growth of living cells due to intrinsic causes, not to an infective agent," and "that these cells might be as capable of transference to a second individual as they are of carriage from one part of the body to another," is entirely unsupported by any facts whatever, or even by any analogy, including the grafting of tissue.

I am, Sir,

Yours faithfully,

Driffield, E. Yorks,

21st Nov. 1903.

A. T. BRAND.



THE PRACTITIONER.

M A R C H 1904.

THE DIAGNOSIS OF ENTERIC FEVER

By CLAUDE B. KER, M.D., F.R.C.P.ED.,

Medical Superintendent of the Edinburgh City Hospital.

THE insidious invasion of Enteric Fever, its liability to resemble various other acute diseases, and the extraordinary varieties of type which may be exhibited by its course, combine to render its diagnosis a matter of considerable difficulty. It may be said with justice that the only absolute proof of its existence, in a given case, is the isolation in pure culture of the *Bacillus typhosus* from the patient under consideration. Short of this, our diagnosis must depend on the presence, in varying combinations, of certain signs and symptoms, none of which are constant, and many of which are not infrequently absent. We have also, in the serum-reaction, a test which, if not infallible, is in the vast majority of cases of the greatest assistance.

CLINICAL DIAGNOSIS.

Putting aside in the meantime the different bacteriological methods, which have so often to be employed finally to settle the nature of a case, it will be well in the first place to consider the means at our disposal for coming to a definite opinion without their aid. The commencement of the fever is so insidious that, as a rule, the case is seldom seen in the first few days of the fever. The average enteric patient can keep his feet and often do his work for the first week or ten days of his disease. The lower he is in the social scale, the later he is likely to call in medical aid; but when he has ultimately come under observation, a great deal can be learned from his account of the symptoms from which he has suffered. The symptoms usually complained of fall naturally into two groups; firstly, general symptoms pointing merely to fever and toxæmia, and secondly, various local

symptoms pointing to derangement of the alimentary or other systems. Thus every patient who suffers from an elevated temperature, whatever be its cause, is liable to complain of loss of appetite, loss of sleep, feelings of chilliness, headache, and indefinite pains in the trunk and limbs ; and such symptoms are naturally complained of at the commencement of typhoid, as they are in other febrile conditions. But in addition to this the enteric-fever patient probably complains of either diarrhoea or constipation ; the bowels, indeed, are very seldom normal. A very large number complain of abdominal pain or uneasiness. Epistaxis is a frequent symptom of the invasion-period, occurring in my experience in nearly 30 per cent. of the cases. Much more rarely cough, due to the bronchial catarrh which is almost invariably present, may have been troublesome enough for the patient to give it a prominent place in the recital of the history of his case.

Now, on studying these two groups of symptoms, the general and the local, we may deduce from the first that the patient under consideration has probably been suffering from a febrile condition ; and if the temperature at the moment of examination is found elevated, it is natural to conclude that we are dealing with a case of a continued fever dating from his first symptom. And in addition to this, if even one of the symptoms noted above, either abdominal pain, diarrhoea, or epistaxis, is noted in the patient's history, there is a fair chance that he is suffering from enteric fever. Constipation, though very often present, does not give such a valuable suggestion, as it is liable to complicate many febrile diseases. Cough, again, is misleading, and would turn our thoughts towards some pulmonary affection.

And now, as regards the symptoms presented by the case at the moment of examination, it is well to remember that it is not unusual for the patient to walk into the doctor's consulting-room. It is quite possible that he is able to return on several occasions before he has to take to his bed. The most common complaint is undoubtedly one of digestive trouble, and the tendency is often, in view of the appearance of the tongue, to assume that the case is merely one of gastric catarrh. The late Sir Thomas Grainger Stewart used to warn his students that if a case of supposed gastric catarrh did not

at once improve under bismuth, rhubarb and soda, enteric fever should be suspected, and the patient's temperature taken. The comparatively-slow pulse of the enteric patient makes the physician apt to assume that there is no fever, and, if busy, he may omit to take the temperature at all. Another patient may refer all his symptoms to his chest, and be treated in consequence as a slight bronchitis. If, however, the doctor is fortunate enough to see the case first in bed, there should be much less chance of the real nature of the malady being missed. The appearance and facial expression are often very suggestive. A slight hectic flush and widely-dilated pupils are often noted, especially during the first fortnight. If, however, the patient has been ill long, and especially if he has drifted into the typhoid state, the pupils are apt to become normal in size, and even contracted in certain cases.

The temperature, the pulse, and the respiration will next attract the attention of the physician. As regards the temperature, if any record of its previous course has been kept, a chart showing the gradual easel-like rise, so frequently noted in the fever, would naturally go far to make a positive diagnosis. But unfortunately some cases of enteric commence singularly abruptly with a high temperature; and, while we may still say with Wunderlich that a patient presenting a temperature of 104° F. on the first day of his illness is *probably* not suffering from enteric, we must be prepared to meet occasionally with exceptions to this rule. In any case, at the end of the first week we shall find that the patient has the temperature elevated, and in a case of average severity this temperature varies from 101° to 103° F. A morning remission more or less marked, usually from a degree to a degree and a half, is the rule in all except the most severe cases, and should always favour a positive diagnosis. Two suggestive features are furnished by the pulse. Dicrotism is the rule, and the rate of the pulse, though more rapid than normal, is usually considerably lower than would be expected from the height of the temperature. A pulse, therefore, which presents this want of relation to the temperature and at the same time is dicrotic, should always suggest that the fever is enteric. This want of relation is, however, frequently lost in the third week of the fever, when the pulse is apt to become more rapid; but it is an admirable guide in the first

fortnight of the fever. Again, during this early period of enteric fever it is unusual to find the respirations very frequent, and if they are above 28 or 30 in an adult, there is a presumption that the case is not enteric, but something pulmonary. Later in the course of the fever, if the case is a severe one, the respiration is often rapid from congestion at the bases of the lungs. It must also be remembered that we may at any time meet with an enteric patient suffering from a pulmonary complication.

The tongue in enteric fever is very often heavily furred behind, dry in the centre, and clean and red at the tip. But although such an appearance is more or less suggestive, it is frequently met with in any sharp case of continued high temperature. Tumiditiy of the abdomen is so much the rule that a case with a flat or hollow abdomen is usually not enteric. Tenderness in the right iliac fossa, when the symptoms point to enteric fever, is a valuable corroborative sign. It is, however, by no means always present. The value of gurgling is much overrated. It can be elicited in other conditions, and the less pressure that is put upon an enteric abdomen the better. I have long ceased to practise it, in consequence. In the examination of the abdomen the main point is undoubtedly the recognition of spots. The frequency with which these occur is variously estimated. In hospital they are not seen in half the cases, but as a rule a patient does not reach hospital early, and in many instances it is quite probable that they have been present previous to admission. Their absence is of no value in coming to a diagnosis : their presence, if they are typical, is practically final. Occasionally, also, spots are noticed which may not conform in appearance to the classical descriptions. In the records of my own cases I find "doubtful" or "suspicious" spots not infrequently noted, and it is interesting that the vast majority of cases in which they were seen were ultimately found to be enteric. It would therefore seem that the presence of even atypical spots is of considerable value in diagnosis ; such spots, no doubt, being due to the typhoid toxine, but for some reason imperfectly developed. Enlargement of the spleen is practically invariable, but it is not always easy to make sure of it by percussion. The occurrence of the classical ochre or pea-soup stools is in favour of a positive diagnosis, but it must be

remembered that similar appearances may be presented by the stools of patients suffering from other febrile diseases.

Enough stress is hardly laid on the presence of slight bronchitis or bronchial catarrh. A case of continued pyrexia in which no definite symptoms of enteric are noted, but in which is found a slight degree of bronchitis, is very probably enteric. A bronchial complication is practically always present in a greater or less degree: it is, in fact, to be considered as one of the signs of the fever. Lastly, any patient who, in addition to continued high temperature, suffers from haemorrhage either from the nose or from the bowel, is in the first instance very probably a case of enteric fever, and in the second almost certainly so.

Only a certain number of the above-detailed symptoms may be found in any given case. It is the fact that so many of them are often in default, which gives to the diagnosis of enteric fever both its uncertainty and its chief charm. In the vast majority of cases a conclusion can be reached by the observation of these points alone. A diagnosis may also often be arrived at by the exclusion of any other cause of the fever. To assist us further, however, short of the actual isolation of the typhoid bacillus, we have the diazo-reaction of Ehrlich, the information to be obtained from a blood-count, and the serum-reaction or Widal test, all of which will be referred to later.

DIFFERENTIAL DIAGNOSIS.

The difficulties of diagnosis are well illustrated by a list of the cases sent to the Edinburgh City Hospital as enteric, or as "observation" cases for that disease. Out of 1,159 consecutive admissions, 347 cases proved to be other diseases. As is only to be expected, certain diseases occur on this list much more frequently than others, and acute lobar pneumonia occupies first place, 73, or nearly a fifth of the whole number of wrongly-diagnosed cases, being instances of this disease. Of other conditions affecting the respiratory system, bronchopneumonia was responsible for 39 cases, and curiously enough the list includes no less than 8 cases of pleurisy with effusion, and 1 case of empyema. Thirty cases are classed as constipation, and appeared to be suffering chiefly from sphaeræmia.

Possibly some of these were in reality due to infection by the *Bacillus coli*, one undoubted case of which condition is also included in the list. In twenty-two children the final diagnosis was "diarrhoea" from various causes, such as improper feeding and food-poisoning. Three patients suffered from appendicitis. Of conditions affecting other systems, there were 8 cases of inflammation affecting the female pelvic organs, and 5 cases of meningitis, which were apparently not tubercular in origin. Of the general diseases, influenza was noted 55 times, the disease in most cases being of a prolonged type with marked gastro-intestinal symptoms. There were 39 instances of tubercular disease : of these no less than 12 were cases of acute miliary tuberculosis, 9 were phthisis, 9 tubercular meningitis, 5 tubercular peritonitis, and 4 various local lesions. Eighteen cases proved to be typhus fever, an infection which, but for its rarity, would doubtless have headed the list. Acute rheumatism was observed on six occasions. Of the other admissions it may be said that, with the exception of a single case of Malta fever, they presented no special interest, and were apparently the result of a diagnosis too reckless to be worth consideration.

Except for the fact that no case of ulcerative endocarditis appears among the diseases above noted, the list may be taken fairly to represent the conditions liable to be mistaken for enteric fever in this country. A rough rearrangement of them shows that 142 cases out of a total of 347—that is to say, more than three-eighths of the whole—were conditions affecting the chest. The alimentary system suffered in 60 instances ; the nervous system in 14. General diseases, other than tuberculosis, account for 79 cases, while all the tubercular cases added together mount up to 39. I think the great deduction to be made from these statistics is that the chest should always be thoroughly examined before a diagnosis is made, however much the case resembles enteric fever ; and that, secondly, so far as possible, the conditions above noted should be excluded.

Lobar pneumonia occupies such a prominent place that it will be well to consider on what grounds such a large number were sent in. In the great majority of cases it is only fair to say that on admission the physical signs were not by any means typical. In some, indeed, it was two or three days

before any physical signs were found at all. In a large proportion the lesion was at the apex, and the greater number suffered from marked delirium, and were in the "typhoid state." In some, on the other hand, the symptoms were comparatively mild, but the respiration at the moment of admission was hardly accelerated, and there was little or nothing to attract attention to the chest. Still it must be admitted that, if the chest was examined, as a routine, in every case of suspected enteric, this particular mistake would occur much less frequently. Again, it should be remembered that, while enteric fever may occasionally start with the abruptness of a pneumonia, it very seldom does so, and a little more attention to the history of the patient's illness would help to prevent error. The presence of labial herpes, very rare in enteric, should always rouse suspicion of a pneumonia. And it should not be forgotten that the "typhoid state" is liable to occur in any acute fever; that by the administration of too much milk to a patient suffering from high pyrexia a very fair imitation of the classical stools of typhoid may be obtained; and that, moreover, the abdomen is apt to become most suspiciously tumid.

Much more difficult and interesting is the differential diagnosis of enteric fever from the tubercular conditions. Acute miliary tuberculosis is often anything but easy to diagnose. Of the twelve cases in the above series, very few were recognised till they had been a week or more in hospital. Some were accepted as enteric cases till several negative results were given by the Widal test. In these the relation of the pulse to the temperature was similar to that of enteric fever, and the course of the temperature itself showed the type usually associated with the period of advance in the latter disease. The diazo-reaction is valueless here: practically all cases of acute tuberculosis give it. The respiration in many cases is unaffected till towards the end, when its frequency is usually suddenly and markedly increased. Physical signs on auscultation may be altogether wanting. The most useful indication is a certain duskiness or lividity of the face and extremities, which is often noticed, and has in several of the above cases first drawn attention to the true nature of their condition. The spleen is not so constantly enlarged in cases of miliary tuberculosis as it is in enteric, and in a case where there

is no increase in size, suspicions should be aroused. As regards indications to be got from the examination of the abdomen, unless the cerebral membranes are affected, the abdomen of the tubercular case is not retracted. It may even be meteoric. The presence of typical spots would of course decide the question on the one hand, as would the recognition of tubercles in the choroid on the other. An additional difficulty lies in the fact that the two diseases are said occasionally to coexist. My own experience leads me to the belief that often Widal's reaction is the only method of diagnosis possible.

The distinction between tubercular meningitis and enteric fever is so classical and so fully described in all the text-books that little need be said here. But the fact remains that the difficulty is often a very real one. Certain cases of meningitis may have a tumid abdomen to the end. Cerebral cases of enteric may have all the symptoms, such as the cerebral cry, strabismus, *tache cérébrale*, vomiting, and so on, usually associated with the more fatal condition. The old axiom that in enteric fever headache ceases when delirium begins is of value when one is dealing with older children or young adults. Again, in tubercular meningitis the pulse is usually either faster or slower than is the case in enteric. A very slow pulse, hardly raised above the normal rate, would certainly point to the brain-condition. If we are lucky enough to find tubercles in the choroid or spots, the case is of course cleared up. In one of the series of cases noted in this paper the two diseases were co-existent. I may say, in favour of the great value of Widal's reaction, that the case was regarded as tubercular meningitis throughout, and the test was supposed to be wrong, till the necropsy showed the lesions of both diseases.

Tubercular peritonitis is only likely to resemble enteric in its early stages; that is to say, before either glands or fluid can be appreciated in the abdomen. But the whole appearance of these cases is not unlike that of a mild enteric, and in several instances it was a negative Widal test which first aroused suspicion as to their real nature.

As regards typhus it is usually only those cases with a poorly-developed rash which are likely to be confused with enteric fever. Typhus is now so seldom seen that it is hardly worth while discussing the distinctions between the two. The

commonest error is to mistake a severe enteric case in the typhoid state, and with an eruption profuse and not disappearing well on pressure, for a true typhus. The diazo-reaction is again worthless here, as all cases of typhus give it.

As regards influenza, when there are intestinal symptoms, it is sometimes difficult to distinguish, but from the point of view of hospital diagnosis its nature is usually made plain by the case seldom lasting more than ten days, or in other words, two or three days after its admission. Marked frontal headache and marked pain in the back are more suggestive of it than of enteric. The presence of coryza would also be in its favour. The spleen, moreover, is not so frequently enlarged. Like enteric, on the other hand, its pulse-rate is often relatively slow, though marked dicrotism is not nearly so common.

In the last few years bacteriological research has added a new difficulty to the diagnosis of enteric fever by the discovery of infections which depend on the *Bacillus coli communis* and on the bacillus of Gärtner. A case may very much resemble enteric fever and yet fail to give the Widal reaction. It may react on the other hand with the colon-bacillus, and that bacillus may be obtained in pure culture from the urine or the blood. Although in the short limits of this paper the question can hardly be discussed fully, it is very interesting to note a series of cases reported by Burch. These presented a fever of ten days, a diminution of leucocytes, and, generally speaking, the symptoms of mild enteric. The *Bacillus coli* was cultivated from the urine, and was agglutinated by the serum of the patients. None of the cases gave Widal's reaction. Burch seems to regard them as a mixed infection by both the colon- and the typhoid bacillus, but it is hard to reconcile this view with the absence of a serum-reaction with the bacillus of typhoid. I should unhesitatingly accept them as instances of colon-infection. More difficult still are the cases depending on what are called "intermediate" bacilli. Libman had a case in which he cultivated an intermediate bacillus from the gall-bladder and urine of a patient during life, but in this the post-mortem appearances were those of enteric, and the Widal reaction was ultimately obtained. He regarded it as an ambulatory typhoid with a secondary infection by another organism. Lastly, a case of Osler's, investigated by Gwyn,

had all the classical symptoms of enteric, including spots, but apparently depended on a typhoid-like organism which was not the *Bacillus typhosus*. It did not give Widal's reäction. It must be confessed that the diagnosis of cases of this type must be left to the bacteriologists. In any case, from the public-health point of view, it is wise to treat them as enteric.

It is not necessary to go into detail as regards other diseases. Any acute condition in which it is possible for the patient to fall into the typhoid state is liable to be confused with enteric fever. In most there will be found some indication to set the physician on the right path. Ulcerative endocarditis is from all accounts one of the most difficult to distinguish. Unfortunately I have not so far had a case sent into hospital as enteric.

THE DIAZO-REÄCTION.

There is no doubt that the diazo-reäction of Ehrlich given by the urine is a most useful addition to the means at our disposal for diagnosis. Being a very easy test to carry out, it is curious that it is not more used in general practice, as it is particularly in the early days of the fever, before a case is likely to be removed to hospital, that the reäction is found. It is unusual for its appearance to be delayed beyond the sixth day. Such cases as I have been fortunate enough to get early, have shown it on the fourth or fifth, and this experience is in accordance with that of those who have recently written on the subject. During the second week it is almost always present, and it is only after the fourteenth day that it is liable to be found wanting. With Widal's reäction the reverse is the case. It is not to be depended on with any certainty in the first week, and may be delayed till the end of the second. It is, therefore, in early diagnosis that the diazo-reäction has its chief scope.

It must be, of course, remembered that the reäction is found in other conditions. It is almost invariably present during the eruptive period of measles, but that of course is no bar to its successful use in diagnosing enteric fever. Unfortunately, however, it seems to be always present in typhus (all the cases of that disease which I have tested have given it), and it is usually to be found also in miliary tuberculosis. It is just these two fevers which it is especially difficult to distinguish from

enteric; so the test has a very serious limitation in that respect. It is occasionally, but rarely, present in lobar pneumonia, and is still less frequently found in broncho-pneumonia. As regards tubercular meningitis and phthisis, it may be found in these diseases, especially when they are approaching a fatal termination. It has been said that it is particularly liable to appear in gastro-intestinal disturbances, and that it has some relation with indicanuria; but Loeper and Oppenheim, who have recently made an exhaustive examination of the test, have reason to believe this is not the case, and my own experience is similar to theirs.

The chief value of the test, in my view, is rather its absence than its presence. A case of continued fever which at any time between the sixth and the twelfth days does not give this reaction is in all probability not a case of enteric fever. On the other hand, if it is present, it is necessary to exclude the eruptive fevers, miliary tuberculosis, and pneumonia before assuming that the case is one of enteric. If these are excluded, a case giving the reaction is much more likely to be enteric than anything else—for instance, than influenza. Later on in the fever, after the second week, the reaction often persists, and, when present, may be of some corroborative value.

BLOOD-COUNTS.

In marked contradistinction to most other infections, the leucocyte-count in enteric fever is a low one. The white corpuscles seldom reach 10,000 per cubic millimetre, and at times may be very low indeed, Curschmann having met with only 1,400 in a case which ultimately recovered. An average count in the fever would be 6,000, and in severe cases an exacerbation of the disease may reduce the number considerably. Complicating conditions, which would be of themselves liable to cause leucocytosis, will of course raise the number. The value of a count in differential diagnosis—for instance, from a pneumonia—is, therefore, considerable. Unfortunately in the early stages of the fever there may be an increase in the number of white corpuscles, a fact which detracts from the merits of this aid to diagnosis in the first week.

As regards the relative proportion of different varieties of leucocytes, the multinuclear cells are diminished in percentage.

The percentage of uninuclear cells is increased, the increase being chiefly in the large cells. The percentage of eosinophiles is small. These blood-changes may corroborate a diagnosis of enteric in certain cases, but on the whole they may be said to have a limited value.

THE ISOLATION OF THE BACILLUS TYPHOSUS.

The bacillus may be successfully cultivated from the spleen, the stools, the spots, the urine, and the blood. As to the spleen, a sterilised hypodermic syringe may be introduced, and a drop of blood sucked into the needle. While in some works on bacteriology this method is said to be safe, most authorities agree that it is seldom, if ever, justified. To obtain bacilli from the stools, it is necessary that the case should not be of more than 10 days' standing. After the necrotic changes commence, the bacillus is difficult to isolate successfully. In any case considerable time is usually wasted in distinguishing it from other similar organisms. It is questionable whether much is to be gained by cultivations from the spots. If they are at all characteristic, the information obtained is superfluous. In a series of fourteen cases reported by Richardson, bacilli were cultivated from no less than thirteen before a positive Widal reaction could be obtained. His method is to freeze the spots with ether to secure absence of blood, make a cross incision, and scoop out the spot with a curette. The contents of the curette are incubated in bouillon. In certain cases bacilli may be cultivated from the urine, in which they are said to occur in 25 per cent. of all cases of enteric fever. In three cases Gwyn succeeded in securing cultures before a positive Widal test was obtained. While it must be admitted that the discovery of the bacillus settles the case, a negative examination by this method would be of no value in diagnosis at all.

Cultivations from the blood are of more use in diagnosis, as apparently the bacillus can be obtained in a very high proportion of cases. The points to be observed are, firstly, to take a comparatively large quantity of blood, as the bacilli are present only in small numbers; and, secondly, to dilute it thoroughly in liquid media, as the growth of the bacilli will be hindered by the presence of too much blood in the medium. Thus Cole takes 10 cc. of blood by inserting the needle of a sterilised

syringe into a superficial vein, and dilutes it in varying proportions (from 1 in 75 to 1 in 150) of bouillon. If after 24 hours' cultivation the bouillon is cloudy, plate-cultures are made. By this method he has isolated the bacillus in 11 out of 15 cases, and in 5 cases before a positive Widal test could be obtained. The earliest successful case was on the sixth day of the fever. Frequently a definite opinion was given within 36 hours.

None of these methods of diagnosis—final as they must be regarded, if the bacillus is isolated,—are of much use to the general practitioner, owing to the technique required in even making the culture quite apart from the subsequent recognition of the bacillus. This disadvantage puts them on quite a different footing from the Widal test, the result of which can be obtained by merely sending a specimen of blood to a laboratory.

THE SERUM-REACTION TEST.

While the cultivation of the *Bacillus typhosus* from the blood or the stools may be the most accurate method of diagnosis, far the most convenient is undoubtedly that by the serum-reaction usually associated with the name of Widal. It is very easy to perform this test, and, although it is not to be relied upon in the early days of the fever, it is wonderfully accurate in finally settling the nature of the case in doubt. Unfortunately, simple though it is, it requires a freshly-incubated culture of the bacillus, and therefore is almost impossible for the general practitioner to carry out himself. There are so many laboratories, however, which are ready to do this class of work, that this can hardly be regarded as a bar to its employment.

It must be admitted that we not rarely meet with physicians of experience who profess little faith in this test. I attribute this to the fact that it is too often very carelessly performed. An absolutely-pure culture of less than twenty-four hours' growth is required, and stock-cultures should not be subcultivated too frequently. I made it a rule never to make an examination without two checks at least on the result, a specimen of a known typhoid blood, and a specimen of a known negative blood being always mounted for comparison with the blood undergoing the test. If either of these fail to react as expected,

I do not blame the accuracy of the test, but assume there is something amiss with the culture. It is also very important to see that all the glass used, whether slides or pipettes, should be thoroughly clean, otherwise the results cannot be relied upon. I also regard it as a great advantage to dilute the blood, either at the moment of taking it, or at any rate before it is mixed with the bouillon culture. Otherwise certain bacilli may be suddenly brought into contact with a practically undiluted serum at the moment of mixing, and partial reactions may occur. As regards the dilution finally employed, I have used from the first that of one in thirty. It is the fashion now to suggest that anything under one in fifty is unreliable ; but I was using the one in thirty dilution at a time when dilutions of one in ten and one in fifteen were being recommended, and I had such a small margin of error that I saw no reason to change my methods when it was realised that dilutions below one in twenty gave many doubtful results. After seven years' experience I regard the test as practically infallible, if it is employed with proper precautions, although it is frequently absent even in the second week of the fever. In a series of 1,159 specimens of blood examined (all of hospital cases under my own treatment) I have had only 18 questionable results, a margin of error of well under two per cent. In all the cases which came to the post-mortem table, 85 in number, the reaction was proved to be accurate : those cases which had given a negative reaction, 28 in all, had no enteric lesions, whereas the remaining 57, all positive during life, showed the characteristic enteric changes. As regards the cases that survived, or on whom no necropsy was obtained, I have had, of course, to trust to clinical diagnosis, but even when, at the time of performing the test, the result caused surprise, the subsequent course of these cases was in accordance with the verdict of the reaction. Of the 18 cases classed as doubtful or as wrong results, several which gave the reaction, though not suffering from enteric fever at the time, had had the disease, or else an undiagnosed and prolonged illness, before. Several of those which did not give the reaction I would now, in the light of recent experience, probably class as colon or paracolon infections, and not as enteric after all. In fact, I believe that these recently-noted infections are responsible for much of the

distrust of the serum-reaction which one meets with in some quarters, such cases being clinically almost indistinguishable from enteric fever.

The conclusions to be drawn from the results of a test are briefly as follows :—A positive reaction means that the patient has enteric fever at the moment, or else has suffered from that disease previously. It is well nowadays to enquire also as to whether the patient was ever vaccinated against typhoid. A negative reaction in the first fortnight of the fever means little or nothing. If, however, it is still negative in the third week, there is a strong presumption against a diagnosis of enteric. Should a negative reaction be still obtained after the third week is over, for practical purposes the idea of enteric may be dismissed. It will be seen that for the consolation of those of us who regret what might almost be called the emasculation of clinical diagnosis by bacteriology, the test, finally accurate as I believe it to be, leaves plenty of time for the exercise of our clinical abilities.

PRINCIPAL REFERENCES.

Colon and paracolon infection: Burch, *New York Med. Journ.*, May 31, 1902; Berg and Libman, *Journ. of Amer. Med. Assoc.*, June 2, 1902; Gwyn, *Johns Hopkins Hospital Reports*, VIII.

Diazo-reaction: Loeper and Oppenheim, *Gazette des Hôpitaux*, May 25, 1901.

Isolation of bacillus from blood: Cole, *Johns Hopkins Hosp. Bulletin*, July, 1901; Courmont, *Société Méd. des Hôp. de Lyon*, January 17, 1902; Busquet, *Presse Médicale*, January 15, 1902.



ANTI-TYPHOID INOCULATION.

BY A. E. WRIGHT, M.D.,

*Late Professor of Pathology, Army Medical School, Netley; Pathologist to St. Mary's Hospital, Paddington, W.*PART II.—*Continued.*

DOSAGE OF ANTI-TYPHOID VACCINE.

IT will be manifest that the question as to what quantum of vaccine constitutes an appropriate dose is a question which can be determined only by the method of trial and error, *i.e.*, by the method of giving a series of graduated doses to a series of different individuals and selecting for employment the quantum which is found to be most appropriate.

In connection with the determination of the most appropriate dose, we may guide ourselves by reference to the clinical symptoms developed and in particular to the height of the temperature reaction. Or alternatively we may guide ourselves by reference to quantitative estimations of the content of the blood in antitropic substances.

In taking the clinical symptoms as a guide we are liable in the present state of our knowledge to fall into grave error.

(a) We may, for instance, in the case where an inoculation has failed to induce a temperature-reaction, draw from this fact the inference that the inoculation has been entirely unprofitable. Such an inference may be altogether erroneous. An elaboration of antitropins may in my experience occur quite independently of any temperature-reaction or other constitutional disturbance.

(b) We may fall into the error of believing that the more severe the constitutional reaction and the higher the fever, the greater must be the quantum of antitropins developed. Such an inference would be altogether erroneous. In point of fact very severe constitutional reaction is often associated with a prolonged impoverishment of the blood in protective substances. I have had experience of this in my own person in connection with the inoculation of a large dose of anti-typhoid vaccine. The observations made by Dr. Tooth in South Africa

to the effect that a severe constitutional reaction had occurred in many of the inoculated who afterwards contracted typhoid fever, points in the same direction.

(c) When we have realised that the inference referred to under (a) is unwarranted, we may fall into the contrary error of assuming that a condition of immunity is being achieved in cases where the absence of constitutional reaction is in reality imputable to the inoculation of a defective vaccine or a deficient quantity of vaccine.

(d) When we have realised that the interference referred to under (b) is unwarranted, we may fall into the contrary error of inferring from the absence of fever that the quantum of vaccine which is being inoculated in a series of successive doses is not excessive. In the case set forth (Chart 6, page 130) there was nothing in the temperature which suggested that a cumulative negative phase was being induced.

We cannot safeguard ourselves against error in the dosage of vaccine except by making after inoculation a systematic series of blood-examinations upon the patients. In connection with experiments undertaken for the purpose of fixing the optimum dose—or, as the case may be, doses—of a vaccine, difficulties will present themselves which are in all respects similar to those which were under discussion in connection with the question of the selection of the absolutely best vaccine.

These difficulties might perhaps be overcome in the case of a regiment or similar aggregate of men, by dividing it up into a number of batches, by inoculating each batch with a different quantum of the vaccine, and then constructing for each batch a curve representing the average course of the reaction of immunity in the batch. Such curves could be obtained by determining upon the pooled¹ blood of each separate group, the bactericidal, bacteriolytic, and agglutinative power which had been developed in the course of the reaction of immunisation. Having selected, after the consideration of the curves of immunisation thus obtained, the optimum dose—or, as the case might be, doses—of vaccine, it would be possible, given a perfect method of standardisation, to arrive without any further experimentation at the dose of any other typhoid

¹ Such pooled blood would be readily obtained by withdrawing, say, 50 cmm. of blood from each individual, and mixing these measured quanta.

vaccine which came to hand. Pending opportunity for carrying out such an experiment as that above described, I now employ in the case of the first inoculation a quantum of vaccine corresponding with 750 to 1,000 millions of typhoid bacilli, and for the second inoculation a quantum of vaccine corresponding with 1,500 to 2,000 millions of the same bacilli ; I find that the inoculation of these quanta induces an ample elaboration of antitropic substances without producing any severe constitutional reaction.

QUESTION OF THE POSSIBILITY OF ALTERNATIVE METHODS OF INOCULATION BESIDE THE SUBCUTANEOUS ROUTE.

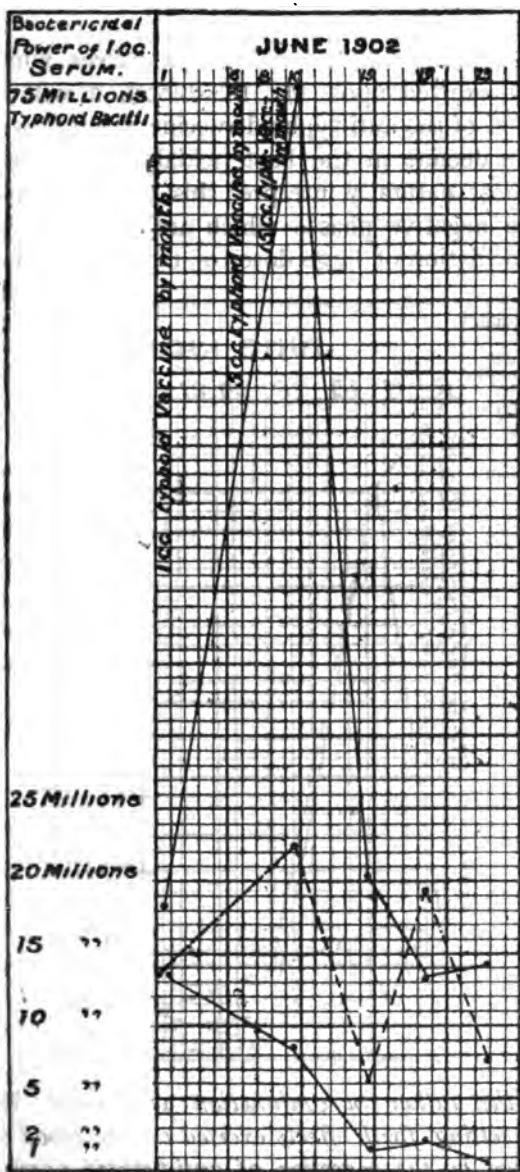
In view of the considerable local pain which is induced by anti-typhoid inoculation, it is natural to enquire whether there may not be some method other than that of subcutaneous inoculation by which the vaccine may be introduced into the body. I was induced by a communication received from Captain C. E. Pollock, R.A.M.C., to take up again, in conjunction with Captain W. Glen Liston, I.M.S., in the summer of 1902, an investigation on this point which I had begun at an earlier date. This time my experiments were destined to be closed by the transference of the Army Medical School to London.

The gleanings from these experiments, which are set out in the curves below, have, if I mistake not, at least a certain suggestive value.

Experiment 1.—The experiment here in question was undertaken upon Mr. F., a Surgeon on Probation in attendance on the Army Medical School, Captain W. Glen Liston, and myself. Mr. F. was a normal uninoculated man ; Captain Liston had undergone anti-typhoid inoculation some two years before the date of the experiments ; and I myself had on three occasions inoculated myself with anti-typhoid vaccine. The last of these inoculations had been undertaken some 15 months before the date of the experiment.

The experiment was begun on June 1st by our drinking in each case 1 cc. of a typhoid vaccine, the dose of which had been fixed for the purposes of subcutaneous inoculation at 1 cc. On June 6th we drank a further 5 cc. of the vaccine, and on June 8th a further 15 cc.

Captain Liston and I did not suffer in any way from the inoculations beyond perhaps a little malaise. Mr. F., who was, it will be remembered, uninoculated, suffered from diarrhoea and



Curve obtained by the author in conjunction with Capt. W. Glen Liston, I.M.S., setting forth the effect exerted on the bactericidal power of the blood by the ingestion of anti-typoid vaccine by the mouth.

Upper Curve.—Effect exerted on author's blood—represented on a threefold diminished scale.

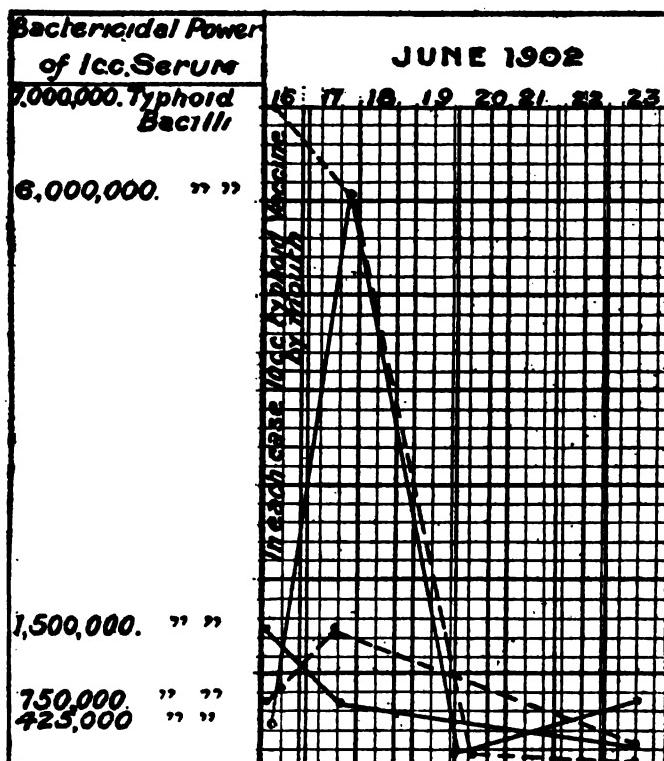
Middle Curve (broken line).—Effect exerted on Capt. Liston's blood.

Lower Curve.—Effect exerted on Mr. F.'s blood.

considerable constitutional disturbance after imbibing the final dose of 15 cc.

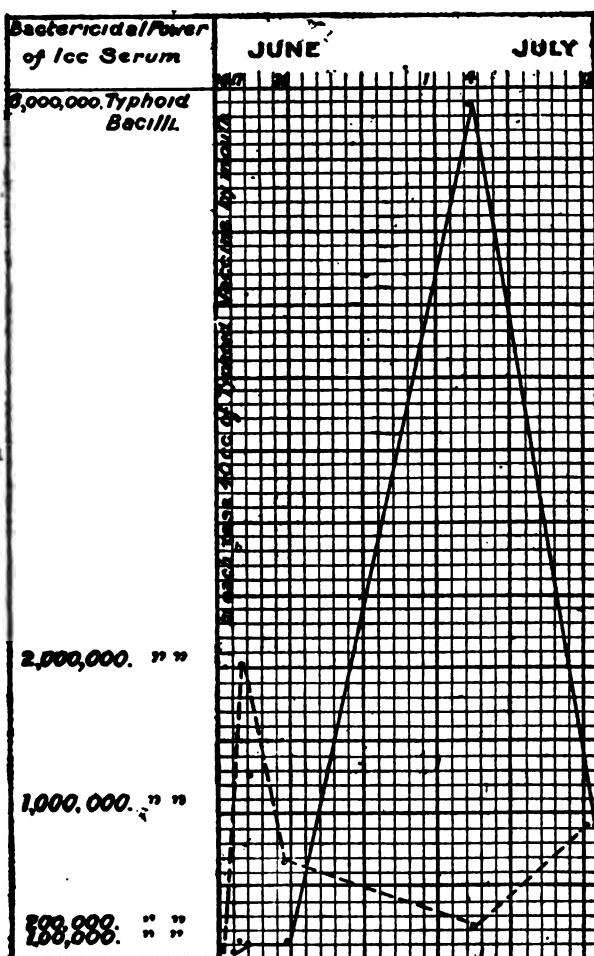
The observations made with regard to changes in the content of the blood in bactericidal substances are set forth in the curve above (page 353).

Commencing with the lowest of the three curves which represents the effect exerted upon Mr. F.'s blood, it will be seen that the ingestion of the anti-typhoid vaccine was followed by a very remarkable decline in the bactericidal power of the blood. We may most naturally interpret this as a negative phase similar to the negative phases which are produced by the subcutaneous inoculation of large doses of typhoid vaccine.



Curve obtained by the author in conjunction with Capt. W. Glen Liston, I.M.S., setting forth effects exerted on the blood of four uninoculated men by the ingestion of anti-typhoid vaccine by the mouth.

Passing to the middle curve, which represents the change that occurred in the bactericidal power of Captain Liston's blood, we see indications of the development of a moderate positive phase. Upon this supervenes a decline, followed again by a positive phase and a second decline. We may suppose that there was here some irregularity in the absorption of the vaccine from the alimentary canal.



Effect exerted on the blood of two rabbits by the introduction of anti-typoid vaccine by the mouth.

In the case of the upper curve, which sets forth on a threefold-diminished scale the changes which occurred in the bactericidal power of my own blood, we have evidence of the production of a very striking positive phase, which was followed by a typical decline. It is interesting to note that this curve gives, so far as it goes, countenance to the suggestion made in Part I. of this paper (page 125) that anti-typhoid inoculation may confer upon the organism a greater power of response to any renewal of the vaccinating stimulus.

Experiment 2.—In the experiment here in question four Surgeons on Probation each drank 10 cc. of the same typhoid vaccine which was employed in Experiment 1. It will be seen, on reference to chart (page 354), that in the case of two of these gentlemen a positive phase of very short duration was obtained. In the case of the other two gentlemen a negative phase only was achieved.

Experiment 3.—In the case of this experiment 40 cc. of the same typhoid vaccine was administered to each of two rabbits. The chart above (page 335) brings before the eye the result of this experiment.

We may surmise that the absence of negative phase may here stand in some relation to the resistance which the rabbit offers to typhoid infection.

While the experiments on uninoculated persons set forth above do not seem to promise much in the way of immediate practical utility, it will be clear that the series of experiments suggests that the phenomenon of immunisation by acclimatisation, which is so strikingly exemplified by the statistical records of the British Army in India, may possibly be the result of an occasional ingestion of the typhoid bacillus into the alimentary canals.

PART III.

Having explained in Part I. the general principles of the physiology of immunisation so far as those principles have disclosed themselves to research, and in Part II. the application of these principles to the problem of immunisation against typhoid fever, we may here take up the consideration of the technique of anti-typhoid inoculation. We may then pass in review the clinical symptoms which follow inoculation and

then proceed to the study of the statistical records which set forth the results of anti-typoid inoculation.

ON THE TECHNIQUE OF ANTI-TYPHOID INOCULATION, AND
ON THE CLINICAL SYMPTOMS WHICH SUPERVENE UPON
THE INJECTION OF THE VACCINE.

In connection with the technique of inoculation we have to consider the sterilisation of the syringe, the method of drawing off the vaccine from the containing vessel, and the selection and preparation of the site for inoculation. Printed instructions with regard to these points have in every case been issued along with the vaccine. These may be summarised as follows :—

(a) *Sterilisation of the Syringe.*—I have recommended that the syringe should in all cases be sterilised by filling it with oil heated to a temperature of about 140° C. I have pointed out that a piece of bread-crumb furnishes a convenient thermometer—the bubbling off of the steam indicating a temperature of over 100° C., and the browning of the bread-crumb after the steam has been driven off a temperature of 140° C. Where laboratory conveniences are not at hand, the oil with the bread-crumb thermometer may be conveniently heated in a tablespoon over an ordinary spirit-lamp. It is probably superfluous to point out that the filling of the syringe with oil at 140° C. secures instantaneous sterilisation.

(b) *Method of drawing off the Vaccine.*—In the case where the vaccine is contained in a capsule, the point of this latter is to be broken off with a sterile instrument after sterilisation in the flame. The capsule having been inverted over the needle of the syringe, its contents may be withdrawn in an aseptic manner. In the case where the vaccine is sent out in a bottle covered in an air-tight manner by an india-rubber cap, the surface of the cap is conveniently sterilised by hot oil carried to it by the syringe. The vaccine may then be drawn off by puncturing through the rubber.

(c) *Choice and preparation of the site of Inoculation.*—It is advisable, with a view to avoiding the pain caused by the tension of the serous effusion which takes place at the point of inoculation, to insert the vaccine into a portion of the body

where the skin is loose. The back of the shoulder and the flank are convenient situations. A fold of skin in one or other of these regions is picked up between finger and thumb, and the needle, after sterilisation of the skin with undiluted lysol, is carried down well into the loose subcutaneous tissue in the centre of this fold.

(d) *The Symptoms which supervene upon Inoculation.*—The character and the severity of the train of symptoms which supervene upon inoculation stand in relation with the dose of the vaccine administered. This is to be understood however with certain reserves. In the first place, it holds true only when we are comparing different doses of the vaccine made from one and the same strain of typhoid. In the second place, it probably no longer holds true after a certain limit of dose has been reached. I have, for instance, had it reported to me that the accidental inoculation, on a transport proceeding to South Africa, of tenfold the prescribed dose was not followed by any greater effect than that which was produced by the inoculation of the prescribed maximum dose.¹

The clinical symptoms which supervene after anti-typhoid inoculation may be classed under the heading of (a) local symptoms, i.e. symptoms at the site of inoculation; and (b) constitutional symptoms.

Generally speaking, the severity of the local symptoms in cases of first inoculation is inversely as the severity of the constitutional symptoms. In cases where very severe constitutional symptoms have been produced, I have seen the local symptoms conspicuously absent.

Again, whereas in the case of the first inoculation constitutional symptoms have been well marked, second inoculations are frequently followed by nothing more than local symptoms.

Local Symptoms.—Where a suitable quantum of anti-typhoid vaccine made from a suitable strain of typhoid bacillus has been injected the local symptoms first make themselves felt after an interval of two or three hours. The effects then seen are the

¹ This last point is theoretically of great interest, indicating, as it does, that the poisonous toxic elements in the vaccine, which evoke an elaboration of antitropic substances, combine with the cells of the organism in quite a different manner from the alkaloidal poisons. The effect of these last is in all cases proportional to the dose administered.

development of a red blush and more or less serous exudation at the seat of inoculation, followed by some lymphangitis along the lymphatics which lead, according as the vaccine has been inoculated above or below the middle line of the trunk, in the direction of the glands of the axilla or of the groin. Where very toxic vaccine has been employed, I have seen distinct local effects supervene in a quarter of an hour, the congestion around the site of inoculation afterwards assuming an almost erysipelatous intensity. This inflammation has never led on to suppuration.

It is a point of interest in connection with the pathology of the serous haemorrhage which occurs at the site of injection that the coagulability of the blood is diminished in a very conspicuous manner as the result of anti-typoid inoculation. The diminution is already very well marked within two or three hours after the incorporation of the vaccine.

With a view to counteracting the tendency to serous haemorrhage at the seat of inoculation I have suggested the administration of 30 or 40 grains of calcium chloride. The restraining influence exerted by calcium chloride in these cases is analogous to that which I have shown it to exert upon the serous haemorrhage of chilblains¹ and of certain forms of urticaria.²

Another point which has an importance in connection with the restraint of the effusion at the site of the inoculation is the circumstance that the ingestion of alcohol, or of any other substance which like alcohol³ diminishes the coagulability of the blood, increases serous haemorrhage and aggravates the local pain, or, as the case may be, brings it back after it has disappeared. Confirmation of my observations with regard to this point has reached me from many different quarters. I may point out that this increased serous exudation in the tissue which has been chemically injured by inoculation is in every way analogous to the exaggerated serous and actual haemorrhage which is so familiar a feature in connection with mechanical injuries received in the condition of intoxication.

¹ Author's paper, *Lancet*, January 30, 1897.

² Author's paper, *Brit. Journ. of Dermatology*, Vol. VIII., No. 89, and *Lancet*, September 19, 1896.

³ Author's paper, *British Medical Journal*, July 14, 1894.

Passing from the consideration of the causes which influence the serous haemorrhage to the question of the treatment of the pain which is referable to it, attention may be drawn to the fact that it is greatly relieved by the application of warm stapes and by inunction with the following ointment :—

B. Acdi Carbolici	-	-	-	-	gr. xx.
Extract. Ergot. Liquid.	-	-	-	-	3 fss
Zinci Oxidi	-	-	-	-	3 i
Lanolin	-	-	-	-	3 i

Two further points may be noted in connection with the effect at the site of inoculation. The first of these is for two or three weeks after inoculation a hard nodule, about the size of a large pea, may be felt on rolling the subcutaneous tissue between the finger and thumb.

The second, and this is a theoretically interesting point, is that it has been reported to me both from India and from South Africa that the site of inoculation has in isolated instances become painful in the case of patients who have contracted typhoid within a few months subsequent to inoculation.

Constitutional Symptoms.—Constitutional symptoms generally supervene on inoculation within the space of two or three hours. Upon one occasion, when experimenting at Netley on four professional colleagues, I have seen rigors supervene within a quarter of an hour. The vaccine inoculated in these cases consisted of one quarter of a cubic centimeter of a sterilised broth-culture of a typhoid bacillus which had been recently isolated from the system of a patient.

It is to be noted that the onset of the constitutional symptoms is hastened and the severity of these symptoms is increased where any muscular exercise is engaged in immediately after inoculation.

It has also appeared to me that inoculation undertaken upon a fasting patient is followed much more rapidly by constitutional symptoms and also by symptoms of a severer type. This last observation, be it noted, has a considerable theoretical interest. The reader who is familiar with Ehrlich's theory of immunity and with Von Dungern's experiments¹ in

¹ V. Dungern: *Die Antikörper*, p. 103, Jena, 1903.

connection with the immunisation of rabbits against crabs' blood will recognise that the occupation with food-elements of the receptors which subserve the nutrition of the cell may quite well delay the incorporation of the toxic elements of the vaccine with the cell-protoplasm.

With the doses of vaccine which I now employ—doses which I have said are quite sufficient to elicit a satisfactory elaboration of typhotropic elements—the constitutional symptoms are limited to some headache and to two or three hours of real malaise. As soon as these symptoms have passed off—generally five to six hours after the inoculation—the patient feels inclined for food and for sleep. His sleep is somewhat broken. Next day his temperature comes down to normal, and he feels comparatively well except in the respect of pain at the seat of inoculation.

With the larger single dose which was employed during the South African campaign symptoms of collapse and rigors were not unfrequent. These symptoms, although to the experienced eye they in some cases appeared alarming, in no case led to any accident.

Recovery appears to have been slow in some cases where severe constitutional symptoms were produced. It may be surmised that such delayed recovery was associated with a prolongation of the negative phase.

The practical conclusion which is to be drawn from the above is that, where circumstances allow of this being done, it is advisable to employ, instead of the one severe inoculation (which had through the circumstances of the case to be employed in my inoculations in India and in the case of most of the inoculations undertaken upon soldiers proceeding to South Africa), two successive inoculations should be made, adjusted so as to avoid the supervention of severe constitutional symptoms. Experience further shows that the patient may with advantage partake of some light nourishment immediately before or immediately after anti-typoid inoculation; and that he should avoid all physical exertion after inoculation. He may in fact with advantage betake himself to bed or to an arm-chair by the fireside as soon as possible after the operation. A dose of calcium chloride may also be administered to him.

ON THE PROTECTIVE EFFECT OF ANTI-TYPHOID
INOCULATION AS EXHIBITED IN THE STATISTICAL RECORDS.

Before addressing ourselves to the study of the statistical records of anti-typoid inoculation we may with advantage consider certain fundamental points which concern the cogency of statistical evidence.

1. In every case where an enquiry is to be made as to whether a particular inoculation exerts a protective effect, it is essential that there should be included in the observation along with a group of inoculated men also a control group of uninoculated men. The control group, which ought to correspond with the inoculated group in all points save only in the circumstance of inoculation, is required for the purpose of furnishing information as to what, in the absence of inoculation, would have been the incidence and the case-mortality of the particular disease under consideration among those who are included in the inoculated group.

2. It is further essential that there should be placed upon record the exact numbers of both the inoculated and uninoculated groups, and the percentage incidence, and case-mortality of each group.

FALLACIES AND ERRORS WHICH ARE INCIDENT TO STATISTICAL RECORDS SUCH AS THOSE WHICH COME INTO CONSIDERATION IN CONNECTION WITH ANTI-TYPHOID INOCULATION.

To the reader who has not had to concern himself with furnishing or, as the case may be, with sifting statistical evidence, it will perhaps appear a very simple matter to comply with the simple statistical canons formulated above. In point of fact experience teaches that the code can never be wholly conformed to. It follows—and this ought to be put in the forefront in considering any statistical evidence—that the exploitation of statistics without critical discussion furnishes proof either of the *naïveté* of the statistician, or of a desire to turn to advantage that inborn distaste for intellectual effort, which is the most characteristic feature in the psychological organisation of man.

The more important of the complexities which encumber

statistical evidence, such as we have here to deal with, are the following :—

I. It is hardly ever practicable to obtain in an absolutely accurate manner the respective numbers of the inoculated and uninoculated.

This seemingly paradoxical proposition is justified by the following considerations :—

(a) The number of men in inoculated and uninoculated groups is almost inevitably subject to variation during the course of the period covered by the observation. In the case, for instance, of a regiment in India or on service new drafts arrive to join the regiment, time-expired men and invalids return home, and occasional transfers are made. The statistical difficulty which thus arises can be surmounted only by recording for each inoculated and uninoculated man the number of days in which he has been under observation with the regiment.

It will be noted on consulting the critical commentary appended to the statistical table given below that this statistical method has superseded in the case of the Indian statistics for the year 1901 the uncritical method of enumeration employed in the two preceding years.¹

(b) In the case where inoculations are undertaken in the course of an epidemic, we have to deal with a group of uninoculated decreasing *de die in diem* and with a group of inoculated increasing in the same manner.

This statistical difficulty, and the difficulty arising from the associated spontaneous rise and fall of the epidemic, can be surmounted only by calculating the incidence upon the average strength of the two groups during the period of observation, and by calculating the risk of infection before and after the date upon which the average strength was reached. The somewhat intricate principles of this method of computation will be found fully discussed in the chapter of the Indian Plague Commission (Chapter IV., para. 434) which deals with the statistical results of Haffkine's anti-plague inoculations.

¹ The introduction of this more critical method of enumeration is due to the inspiration of Major T. MacCullagh, R.A.M.C., the present statistical officer at the head-quarters of the Army Medical Department.

The method finds exemplification in a paper¹ in which I have set forth the results obtained by anti-typhoid inoculation in the case of an epidemic of typhoid fever which took place in the Richmond Asylum, Dublin.

(c) In the case where subsequent to inoculation, but within the limits of the incubation-period, cases of the disease occur a difficulty arises as to how these cases are to be brought upon the record.

It is traditional with the medical statistician to exclude all such cases from consideration. I think this practice is to be condemned—first, because it can never be certain in the case of an inoculated man that his susceptibility to the disease has not been temporarily increased by inoculation ; secondly, because it is important to have set forth the balance of advantage and disadvantage of inoculation undertaken in the actual presence of infection.

2. *It is a matter of great difficulty to secure the exact comparability of the inoculated and uninoculated groups.*

It was laid down above as one of the theoretical requisites in connection with statistics that the control group should correspond with the inoculated group in all points save only with respect to inoculation. While we are compelled in actual practice to abate something from this theoretical requisite, it is in all cases essential that the control group shall consist of persons who are similar to the inoculated with respect to age, and of persons who live under similar conditions and who are exposed for the same period to the similar risks of infection.

When these essential points have been neglected the statistical conclusions arrived at are entirely without coercive force.

Illustration of the vitiation of statistical records by omission to consider the question of the comparability of the inoculated and uninoculated groups compared is afforded by the statistical record No. 22 in the synoptical table below. The next-following statistical record affords illustration of the fact that a statistical conclusion arrived at by a comparison of the inoculated with a control group selected at random may be the exact reverse of the conclusion which emerges from a comparison with a properly selected control group.

¹ *Brit. Med. Journ.*, October 26, 1901.

3. It has not always been possible to secure a correct assignation of the sick to the inoculated and uninoculated groups respectively.

The determination of the point as to whether a particular patient belongs to the group of the inoculated or uninoculated would also at first sight appear to be simple operation in which it would be impossible to go wrong. This may be taken to be so in the case of soldiers where the fact of inoculation has been entered upon the Medical History Sheets, and where, as in time of peace, the Medical History Sheets are available. Quite other were the conditions in the case of the men entered as inoculated or uninoculated respectively on the records of many of the Military Hospitals in South Africa. The classification of the patient as inoculated or uninoculated then depended upon his own statement. A serious source of error was here introduced. In certain cases where the soldier desired to avoid inoculation, and expected that this would follow if he returned himself as uninoculated, a strong motive existed for making a false return. In other cases, again, confusion arose in the man's mind between anti-typoid inoculation and anti-smallpox vaccination, the confusion being due to the fact that both these processes were carried out on the transports on passage to South Africa.

In addition to these sources of misclassification there were many others which may here be passed over in silence.

4. In a considerable percentage of cases it is notoriously a matter of difficulty to arrive at a certainty in the differential diagnosis of typhoid fever.

The difficulty of the differential diagnosis of typhoid fever from other fevers is notorious. In the case of the army, and in particular in the case of the army on field service, there exists a very intelligible bias in favour of arriving at definite diagnoses ; and the diagnosis which is most in favour in the case of fevers is the diagnosis of typhoid fever.

It follows that, even putting other difficulties aside, the difficulties associated with diagnosis would make absolute accuracy unattainable in statistics referring to the effect of anti-typoid inoculation.

The effect of the inclusion of these doubtful cases, or, as we may perhaps conveniently call them, *pseudo-typoid* cases, in the statistical records will, as consideration will show, operate to the prejudice of reputation of anti-typoid inoculation. It will operate in this manner, inasmuch as the protection will be judged to have failed, not only when the patient contracts typhoid fever, but also when he contracts any other fever which is confused with typhoid fever.

5. *It is difficult to ensure accuracy in the recording of the facts.*

Up to the present we have considered only errors which partake of the nature of fallacies as distinguished from errors arising from sheer inaccuracy and inadvertence. These last, however, can never be completely avoided, and it behoves the statistician in all cases to make careful enquiry for them. On consulting the critical commentary appended to the statistical table below, it will be seen that more or less serious inaccuracies have been detected in connection with four or five of the statistical records.

QUESTION AS TO WHAT STATISTICAL EVIDENCE MAY BE ACCEPTED AS COERCIVE.

In view of the fact that flaws will reveal themselves if only they are diligently and conscientiously sought for in all statistical evidence, the question urgently presents itself as to when and under what circumstances the evidence of imperfect statistics as the protective effect of an inoculation may be accepted as coercive.

The reply that will be made to this question by persons of very great critical acumen will be that it never becomes coercive. Such persons will desire to wait till the evidence is obtained which satisfies the theoretical canons set forth at the outset of this statistical discussion, and they will have to wait indefinitely. The plain, everyday man will find it possible to reconcile the demands of his statistical conscience with the demands of practical life. He will neglect the mint and anise and cummin of statistical criticism while holding fast to important statistical principles.

The essential principles of the statistical law may be compressed into the following propositions :—

1. *Where a flaw has been detected in a statistical record the effect of that flaw upon the cogency of the statistical conclusion is to be evaluated. The statistical conclusion in question is to be upheld where the error is shown to be one which is incapable of exerting an appreciable influence on the result.*

Example 1.—In the case of the statistics relating to the effect of anti-typoid inoculation in the garrison of India for the year 1900 (Synoptical Table, serial number 6), there is a confessed error in the enumeration of the inoculated. That error may, it is estimated, amount to "some hundreds." The proper way to deal with this situation is, not to set aside the statistics, but to consider instead what would be the maximum effect which an error of this particular magnitude is capable of exerting upon the statistical conclusion. Interpreting the error of "some hundreds" in the enumeration of the inoculated in a liberal spirit as an error of 600 one way or the other, the error in the enumeration of the group would amount to a 10-per-cent. error. This particular statistical conclusion is thus seen to be subject to a 10-per-cent. error. In relation to the broad issues which are here under discussion such an error is insignificant. It is a matter of quite subordinate interest whether the diminution of mortality in the inoculated was the 4·4-fold diminution which is actually registered, or a 4·8-fold, or only a 4-fold diminution.

Example 2.—An even more striking illustration of the importance of working in accordance with this statistical principle is afforded by the statistics relating to the garrison of Egypt for 1900 (Synoptical Table, serial number 5). Here we have recorded an 18-fold diminution in the incidence of typhoid fever among the inoculated, numbering 700 odd, as compared with the uninoculated taken as some 2,600 odd. If we include in the number of the inoculated those inoculated in the previous year, who are specifically excluded from the statistical returns here in question, we arrive at an inoculated strength of about 1,000 and obtain a 25-fold diminished incidence. If, again, waiving the legitimacy of this course, we include among the uninoculated the full number of troops

who passed through Egypt in the course of the year in connection with military movements to South Africa, we bring up our uninoculated strength to some 5,000 and obtain only a 13·5-fold diminution. For settling the broad issue which we have in view in this paper it matters nothing whether we accept the highest or the lowest of the above figures as representing the diminution in typhoid incidence achieved in the inoculated.

2. Where a flaw has been detected in a statistical record and where it has been shown that the error in question is an error of such magnitude as to be capable of reversing the statistical conclusion arrived at, the statistical record in question is to be rejected, except in the case where data are accessible which allow of the correction of the error.

Examples.—Examples of statistical flaws which invalidate the conclusion arrived at are furnished by Dr. Melville's statistics and Dr. Crombie's first statistics (Synoptical Table, serial Nos. 7 and 22 respectively). Dr. Crombie's second statistics, as embodied in the Synoptical Table below (serial No. 23), furnish an example of statistics which may be accepted after they have been corrected in the manner provided for by their author.

3. Where the figures are large, all chance errors which may have been committed in the enumeration of the inoculated and uninoculated or in the classification of the sick are spontaneously eliminated, and the statistical conclusions which emerge may be accepted with confidence.

When the figures are small the statistical conclusion is uncertain even in the case where the facts have been accurately recorded.

Examples.—The figures (Synoptical Table, serial Nos. 2, 6, and 25) for the inoculated and uninoculated in the garrison of India for each of the three successive years 1899, 1900, and 1901, are sufficiently large to eliminate the operation of chance.

The figures (Synoptical Table, serial No. 13) for the case-mortality of the inoculated and uninoculated collected by Dr. Dodgson from various Military Hospitals in South Africa are sufficiently large to eliminate the operation of chance. The figures for the case-mortality of the inoculated and uninoculated

obtained by Drs. Elliot and Washbourn (Synoptical Table, serial No. 12), are too small to insure the elimination of operation of chance.

4. *Where there is a source of error which runs through all the statistics and operates always in one and the same direction, that error is not eliminated by the cumulation of figures.*

Example.—The error which is introduced into the statistical records by the inclusion of pseudotyphoid cases among the typhoid cases is not eliminated by the accumulation of figures.

It will be remembered that this is an error which operates to the prejudice of the reputation of anti-typhoid inoculation.

SYNOPTICAL TABLE OF ALL THE STATISTICAL RECORDS
RELATING TO ANTI-TYPHOID INOCULATION FOLLOWED
BY A CRITICAL COMMENTARY ON THESE STATISTICS.

The Synoptical Table below consists essentially of a reprint of the table which I embodied in my statistical paper published in the *Lancet* of Sept. 4, 1902. I have brought it up to date by adding to it three further statistical records which have become available since the publication of my former paper. As explained in connection with my former publication, I have in my table in each case set out the statistical materials in the form in which those materials were furnished by their authors, except only in the respect that I have incorporated with them, whenever such were available, data with regard to the dates of the observations and certain other points of interest.

To the Synoptical Table I have appended a critical commentary. In this I have set forth, but somewhat less fully, the facts which were furnished in Table II. of my previous paper. I desire to emphasise that the data given in the Synoptical Table ought to be studied in the light of the critical commentary.

I.—STATISTICS OF ANTI-
To be studied in Connection with the

Serial Number.	Group which was under Observation.	Interval between Inoculation and Commencement of Period of Exposure.	Place where Group was exposed to Infection.	Period of Observation covered by the Statistics.	Authority for the Statistics.	Reference to published Literature or other Source of Information.	Number of inoculated and uninoculated in the Group.	
							Inoculated.	Uninoculated.
1	Nurses and Attendants, Barming Asylum.	No interval.	Barming Asylum, Maid-stone.	Oct. to end of epidemic 1897.	Dr. J. S. Tew. Mr. A. G. R. Foulerton. Dr. A. M. Jackson.	Public Health, Mar., 1898. <i>The Lancet</i> , June 2, 1900.	84	116
2	Inoculated Regiments and other Units of the British Army in India.	No interval.	Various Stations in India.	1899	Official returns.	Army Medical Report for 1899.	4,502	25,451
3	15th Hussars, wives of same, and officers.	Probably a few weeks.	Meerut, India.	Oct., 1899, to Oct., 1900.	Official returns.	Brit. Med. Jour. and <i>The Lancet</i> , Feb. 9, 1901; reported by Prof. A. E. Wright.	360	179
4	Garrison of Ladysmith.	Two months to 11 months.	Ladysmith, South Africa.	Nov. 2, 1899, to Feb. 28, 1900.	Official returns.	Brit. Med. Jour. and <i>The Lancet</i> , July 14, 1900; reported by Prof. Wright.	1,705	10,529
5	British Garrison of Egypt and Cyprus.	No interval.	Egypt and Cyprus.	1900	Report of Principal Medical Officer, Egypt.	Brit. Med. Jour. and <i>The Lancet</i> , May 4, 1901; reported by Prof. Wright.	720	2,669
6	British Garrison in India.	Varying from no interval to one year.	India.	1900	Official returns.	Army Medical Report for 1900.	5,999	54,554
7	Patients in Tintown Hospital, Ladysmith.	No data.	South Africa.	—	Dr. D. Melville.	Brit. Med. Jour., Vol. I., 1901.	—	—
8	Patients in Stationary Hospital, Harrismith.	"	South Africa.	Sept., 1900, to Sept., 1901.	Maj. C. Birt, R.A.M.C.	Brit. Med. Jour., Jan. 11, 1902.	—	—
9	Patients in Portland Hospital.	"	South Africa.	1900.	Dr. H. H. Tooth.	Brit. Med. Jour., Mar. 16, 1901.	—	—
10	Patients in the Irish Hospital.	"	South Africa.	1900.	Dr. J. B. Coleman.	Transactions of the Royal Academy of Medicine in Ireland, Vol. XIX.	—	—
11	Patients in Scottish National Red Cross Hospital.	"	South Africa.	1900.	Colonel Henry Cayley, I.M.S.	Brit. Med. Jour., Jan. 12, 1901.	—	—

TYPHOID INOCULATION.

Critical Commentary appended.

Number of Cases of Typhoid Fever.		Percentage Incidence of the Disease.		Number of Deaths from Typhoid Fever.		Percentage Death-rate for Typhoid Fever.		Case Mortality— <i>i.e.</i> , Proportion of Deaths to Cases.		Supplementary Facts.
In inoculated.	In uninoculated.	In inoculated.	In uninoculated.	In inoculated.	In uninoculated.	In inoculated.	In uninoculated.	In inoculated.	In uninoculated.	
0	4	0	3·4	—	—	—	—	—	—	12 cases of typhoid fever had occurred in the staff, numbering about 200, before the inoculations were undertaken.
44	657	0·98	2·54	9	146	0·2	0·56	1 in 4·9	1 in 4·5	—
2	11	0·55	6·14	1	6	0·27	3·35	1 in 2	1 in 2·2	—
35	1,489	2·05	14·14	8	329	0·47	3·12	1 in 4·7	1 in 4·5	—
1	68	0·14	2·55	1	10	0·14	0·37	1 in 1	1 in 6·8	—
52	731	0·87	1·69	8	224	0·13	0·58	1 in 6·5	1 in 3·3	—
30	265	—	—	2	5	—	—	1 in 15	1 in 53	—
263	947	—	—	18	135	—	—	1 in 14·6	1 in 7	A comparison of 151 charts referring to inoculated patients with 317 charts referring to uninoculated patients showed that the height of the fever, the duration of the same, the percentage of relapses, and the number of daily evacuations were much less in the inoculated.
54	178	—	—	4	25	—	—	1 in 13·5	1 in 7	—
80	592	—	—	5	74	—	—	1 in 16	1 in 8	—
15	70	—	—	1	10	—	—	1 in 15	1 in 7	—

Serial Number.	Group which was under Observation.	Interval between Inoculation and Commencement of Period of Exposure.	Place where Group was exposed to Infection.	Period of Observation covered by the Statistics.	Authority for the Statistics.	Reference to published Literature or other Source of Information.	Number of Inoculated and uninoculated in the Group.	
							Inoculated.	Uninoculated.
12	Patients in Imperial Yeomanry Hospitals.	No data.	South Africa.	1900-1901	Dr. A. Elliot and Dr. J. W. Washbourn.	<i>The Lancet</i> , Jan. 18, 1902.	—	—
13	Patients in a Variety of Military Hospitals.	"	South Africa.	1900-1901	Dr. R. W. Dodgson.	Official report.	—	—
14	Staff of the Portland Hospital.	A few weeks.	South Africa.	Part of 1900.	Dr. Tooth.	<i>Brit. Med. Jour.</i> , Mar. 16, 1901.	28	13
15	Staff of Imperial Yeomanry Hospital, Deelfontein.	No data.	South Africa.	No data.	Dr. Elliot and Dr. Washbourn.	<i>The Lancet</i> , Jan. 18, 1902.	59	25
16	Staff of Imperial Yeomanry Hospital, Pretoria.	In most cases a few weeks.	South Africa.	Aug., 1900, to Mar., 1901.	Dr. Dodgson.	Official report.	32	73
17	No. 8 } General Hospitals No. 9 } (staffs of). No. 10 }	A few weeks.	Bloemfontein, South Africa.	April to Aug., 1900.	{ " " "	" " "	21 } 87 } 0	110 } 108 } 119
18	Staff of Second Section, Scottish Red Cross Hospital.	A few weeks.	South Africa.	Part of 1900.	Colonel Cayley, I.M.S.	<i>Brit. Med. Jour.</i> , Jan. 12, 1901.	70	12
19	Fifth Battalion, Manchester Regiment.	A few weeks.	Winburg, South Africa.	July, 1901, to Feb., 1902.	Lieutenant J. W. West, R.A.M.C.	<i>Brit. Med. Jour.</i> and <i>The Lancet</i> , April 5, 1902, reported by Prof. Wright.	200	547
20	City Imperial Volunteers.	Probably a few weeks.	South Africa.	1900	Surgeon-Major R. R. Sleman, C.I.V.	Privately communicated.	700	494
21	Patients in Richmond Asylum, Dublin.	No interval.	Dublin.	Sept., 1900, to Dec., 1900.	Mr. H. M. Cullinan.	<i>Brit. Med. Jour.</i> , Oct. 20, 1901; reported by Prof. Wright.	339	268
22	Officers invalided from South Africa (first series).	A few weeks.	South Africa.	No data.	Colonel A. Crombie, I.M.S.	<i>The Lancet</i> , May 3, 1902.	112	109
23	Officers invalided from South Africa (second series).	In most cases only a few weeks.	South Africa.	No data.	Colonel A. Crombie, I.M.S.	<i>The Lancet</i> , Aug. 16, 1902.	102	85

Number of Cases of Typhoid Fever.	Percentage Incidence of the Disease.		Number of Deaths from Typhoid Fever.		Percentage Death-rate for Typhoid Fever.		Case Mortality—i.e., Proportion of Deaths to Cases.		Supplementary Facts.
	In inoculated.	In un inoculated.	In inoculated.	In un inoculated.	In inoculated.	In un inoculated.	In inoculated.	In un inoculated.	
47	301	—	—	4	26	—	—	1 in 11·9	1 in 11·8
764	3,374	—	—	63	510	—	—	1 in 12	1 in 6·6
7	3	25	23	0	1	0	7	0 in 7	1 in 3
4	4	6·8	16	0	0	—	—	0 in 4	0 in 4
3	7	9·3	9·7	0	0	—	—	0 in 3	0 in 7
5 11 —	44 13 36	16·8 93 —	33·5 1 —	0 1 2 6	8 15 0·9 5·8	1 16 0·9 1 in 16	— — 1 in 5·8	The period of observation covers the period of "the great epidemic."	
2	4	2·8	33·3	1	1	1·4	8·3	1 in 2	1 in 4
3	23	1·5	4·2	0	7	0	1·3	0 in 3	1 in 3·3
60	39	8·5	7·9	9	11	1·3	2·2	1 in 6·7	1 in 3·5
6	30	1·8	10·0	1	4	0·3	1·3	1 in 6	1 in 7·5
32	24	28·5	22·0	—	—	—	—	—	—
34	28	33·3	32·9	—	—	—	—	—	The proportion of typhoid convalescents among the inoculated under 26 years of age was 1 in 3; among the uninoculated, 2 in 3; among 13 twice inoculated, 1 in 1·3; among 89 once inoculated, 1 in 3·7.

Serial Number.	Group which was under Observation.	Interval between Inoculation and Commencement of Period of Exposure.	Place where Group was exposed to Infection.	Period of Observation covered by the Statistics.	Authority for the Statistics.	Reference to published Literature or other Source of Information.	Number of inoculated and uninoculated in the Group.	
							Inoculated.	Uninoculated.
24	7th Hussars, South Africa.	A few weeks.	South Africa.	Dec. 20, 1901, to June 20, 1902.	Captain W. A. Ward, R.A.M.C.	Official report.	307	244
25	British Army in India, 1901.	1-2 years.	India.	Jan. to Dec., 1901.	Official returns.	<i>Brit. Med. Jour.</i> , Oct. 10, 1903.	4,883	55,955
26	Lord Methuen's Column, Modder River.	No data.	South Africa.	Dec., 1899, to Mar., 1900.	Surg.-Gen. Townsend, C.B.	<i>Ibid.</i>	2,535	10,981
27	No. 7, General Hospital, Natal.	"	Estcourt, Natal.	—	Dr. Watkins-Pitchford.	Paper read before South African Medical Association.	—	—

CRITICAL COMMENTARY ON THE STATISTICAL RECORDS INCLUDED IN THE SYNOPTICAL TABLE ABOVE.

The data¹ which are available for the evaluation of the statistical records included in the synoptical table above are set forth below under the following headings :—

- A. The system of enumeration adopted ;
- B. The comparability of the inoculated and uninoculated groups ;
- C. The trustworthiness of the diagnosis of typhoid fever arrived at ;
- D. The trustworthiness of the classification of the sick as inoculated and uninoculated respectively ;
- E. The question as to how far the recorded case-mortality correctly represents the case-mortality of the inoculated and uninoculated respectively.
- F. The question as to how far the incidence-rate is affected by the inclusion, among the inoculated, of cases infected before protection was established ;
- G. The light thrown on the question of the duration of protection afforded ; and
- H. The general accuracy of the record.

¹ These data are set forth more fully in Table II., appended to my former paper in the *Lancet*.

Number of Cases of Typhoid Fever.		Percentage Incidence of the Disease.		Number of Deaths from Typhoid Fever.		Percentage Death-rate for Typhoid Fever.		Case Mortality—i.e., Proportion of Deaths to Cases.		Supplementary Facts.
In Inoculated.	In uninoculated.	In Inoculated.	In uninoculated.	In Inoculated.	In uninoculated.	In Inoculated.	In uninoculated.	In Inoculated.	In uninoculated.	
9	20	2·9	8·2	0	3	0	1·2	0 in 9	1 in 6·7	The incidence in 73 once inoculated was 4·1 per cent.; in 334 twice inoculated 2·3 per cent.
33	744	0·66	1·33	3	199	0·06	0·36	—	—	—
26	257	1·0	2·3	—	—	—	—	—	—	—
137	1,017	—	—	3	58	2·19	5·7	—	—	Percentage of mild cases 46 in inoculated, 32·9% in uninoculated; severe cases in inoculated 19·7 per cent., in uninoculated 21·9%.

No. 1.—A. Nominal rolls were made of the inoculated. The number of uninoculated was calculated by subtraction of the inoculated from the total staff. B. There was no difference between inoculated and uninoculated in respect of age or period of exposure to infection; but the inoculated were in the course of their duties (nursing, laundry work) more exposed to risk than the others. Hence the circumstances in this case were more favourable to the uninoculated. C. The diagnosis was made by the medical officers of the asylum in the midst of a severe epidemic of typhoid, so that the risk of errors is very small. D. There was no chance of either inoculated or uninoculated patients being included in the wrong group. G. An agglutinative reaction was obtained two years afterwards in four out of nine inoculated cases.

No. 2.—A. Nominal rolls were made of the inoculated, and the uninoculated were calculated by subtraction of these from the average yearly strength of the unit. Some inaccuracy thus results, which may tell in favour of either group. B. The inoculated would on the average be younger than the uninoculated, as special efforts were made to inoculate the younger men. Otherwise the conditions were the same. C. The diagnosis was made by the Army Medical Officers. The existence of malaria and other tropical fevers would introduce

some risk of error. Such errors would affect both groups equally. D. Records of inoculations were entered on the Medical History-Sheets, and it is possible some errors may have crept in, in either direction, but these would hardly affect the general result. E. Some very slight attacks of typhoid may have passed unrecognised. The facts recorded under the next heading (F) must also be taken into consideration, as the case-mortality may be unfavourably influenced when patients are inoculated in the incubation-period of the disease. F. Five cases (two fatal) occurred among the inoculated at Lucknow within nineteen days after inoculation ; and one case at Agra within eight days after inoculation. By the occurrence of these cases the incidence-rate among the inoculated was increased from 0·84 per cent. to 0·98, and the death-rate from 0·15 to 0·2.

No. 3.—A. As in the last case. B.—E. The remarks made upon No. 2 apply here.

No. 4.—A. The method of enumeration is not on record. B. The conditions of the two groups may be assumed to be identical, as the inoculated and uninoculated are included in many different military units. C. The diagnosis was made by army medical officers and civil surgeons, working under the strain of war in a beleagured town. D. As to the classification, see under No. 13, below. H. Of two deaths recorded to have occurred among inoculated officers, one was due to a casualty in the field. The other officer had been inoculated with serum, not with anti-typhoid vaccine. Among the uninoculated officers a minimum of ten deaths occurred, instead of five as recorded. When due allowance is made for these errors, the case-mortality of the inoculated works out distinctly lower than that of the uninoculated.

No. 5.—A. The number of inoculated is represented to be the number inoculated since rendering previous returns ; the number of uninoculated is calculated by subtracting these from the total average strength of the garrison. The statistical results are rendered unduly favourable to the uninoculated by the fact that among these are included in the records 234 men (11th Hussars) inoculated in India (1889) and a balance of 463 men inoculated in Egypt (1889). There were no cases of typhoid in either of these groups. F. The only case

of typhoid fever among the inoculated was a fatal case in a man inoculated on December 8, 1899, and admitted to hospital January 9, 1900. If it had not been for this case, the incidence on the inoculated, numbering probably over 1,000, would have been nil. G. The fact that no case of typhoid occurred among those inoculated in the previous year seems to indicate a persistence of the protection. H. The number of the inoculated in the West Kent Regiment (228), given as representing men newly inoculated, is identical with the number from that regiment reported as inoculated in the previous year. This suggests a mistake in the entry.

No. 6.—A. The number of inoculated was obtained by adding together the numbers reported from the separate stations; it thus happened that in some cases men were counted twice over, being returned from two places. It is estimated that the total of the inoculated may be wrong by at most "some hundreds." The numbers of the uninoculated are in some cases actuals, in others they are obtained by subtraction of inoculated from the average yearly strength of units. B.—D. The conditions for the most part are as under No. 2. In the case of some at least of the 2,246 men inoculated in 1900 the period of exposure after inoculation must have been less than a complete year. F. In the case of three of the inoculated who contracted typhoid, the attacks supervened respectively 13, 15 and 24 days after inoculation. The first of these cases ended fatally. If these had been deducted, the incidence and death-rate among the inoculated would have been slightly reduced—the case-mortality from 1 in 6·5 to 1 in 7. G. Of the 52 cases of typhoid which occurred in the inoculated in 1900, 21 occurred among the 2,250 inoculated in 1900, and 31 among the 3,750 inoculated in 1899. These figures suggest that the protection persists for more than a year.

No. 7.—A and D. No data are available as to procedure adopted for purpose of classifying the patients into inoculated and uninoculated. C. The case-mortality (1 : 53) attributed to the uninoculated is suspiciously low for typhoid fever. The case-mortality of the inoculated (1 : 15) corresponds with that found elsewhere in South Africa. H. The total typhoid case-mortality of the hospital in which Dr. Melville served

in the months which are covered by his period of observation was 1 in 5·4, not 1 in 40 as would appear from Dr. Melville's figures. (Major S. Westcott, letter to *British Medical Journal*, July 30, 1901.)

No. 8.—A. and D. The numbers of inoculated and uninoculated were controlled by a triple check. C. Major C. Birt, R.A.M.C., confirmed the diagnosis in all fatal cases by necropsy, and all doubtful cases were omitted from the records.

Nos. 9 to 12.—A. and D. No data available as to procedure adopted for the purpose of classifying the patients into inoculated and uninoculated. C. Diagnosis made by the physicians attached to the hospitals.

No. 13.—A. and D. In most cases entries were made in the case of the inoculated, and blanks were left in the records of the uninoculated. Cases transferred from one hospital to another are omitted from the statistics. C. As in No. 2. D. Errors of classification may have occurred owing to statements made in misapprehension by patients who had been vaccinated against small-pox on the transports, or to erroneous statements made by patients who desired for the purpose of avoiding inoculation to represent themselves as inoculated. E. Both officers and men are included in the statistics, the former having, perhaps, a better chance of recovery; but as both classes occur in each group, there is no resulting source of error. H. Dr. Dodgson's report which sets forth the figures collected from the Military Hospitals affords evidence of conscientious compilation and the exercise of a critical spirit in dealing with statistical records which were often vitiated by serious errors.

Nos. 14, 15, and 16.—A. Presumably nominal rolls. B. No data as to age and period of exposure in the two groups. C. The diagnoses were made by the physicians attached to the hospital.

No. 17.—A. Nominal rolls. B. The conditions of the three hospitals whose inoculated and uninoculated staff are here compared were similar; the incidence rate among the uninoculated members was in No. 8, 40 per cent., in No. 9, 28 per cent., and in No. 10, 30 per cent. F. Four cases (none fatal) occurred three to four weeks after inoculation.

No. 18.—A. The uninoculated in the second section probably numbered less than 12. B. As in 14–16 supra. D. As in No. 1.

No. 19.—A. Presumably nominal rolls. B. Conditions the same. C. and D. Diagnosis was in each case made by Lieut. J. W. Wells, who had carried out the inoculations.

No. 20.—No data.

No 21.—A. Nominal rolls were made of the patients as they were inoculated in a series of separate sittings. From these and from lists of cases and dates of attack the average strength of the inoculated and the uninoculated was calculated, for the period covered by the epidemic. B. No data as to age. The average age of the nurses (uninoculated) may probably have been less than that of the patients. The external conditions of both groups were similar, but the nurses (uninoculated), though living among the insane patients, would avoid risks incurred by the latter. Reckoned by the incidence of cases among the uninoculated, the risk of coming in contact with infection was greater after the date at which the number of inoculated reached the number taken as the average strength than it was before this date. C. and D. No source of error. F. Of a total of 6 cases of typhoid fever which developed in the inoculated, 5 occurred within twelve days of inoculation; 1 of these ended fatally. If these cases had been deducted, the incidence on the inoculated group would have been 30 (instead of 6) times less than on the uninoculated.

No. 22.—A. The inoculated and the uninoculated represent two chance groups marked off by the accident of invaliding from the large bodies of inoculated and uninoculated officers who saw service in South Africa. The statistics are vitiated in favour of the uninoculated, for the typhoid case-mortality of the inoculated is, as is brought out by the sum total of the available statistics, 50 per cent. lower in the inoculated. B. The uninoculated were probably older and by reason of their age less susceptible (*see* next paragraph). C. and D. The classification of the patients as convalescents from typhoid depended upon the reports they rendered of the diagnoses arrived at in South Africa. F. One twice-inoculated officer contracted typhoid within a month of landing in South Africa. G. A table in Colonel Crombie's report suggests that the effect of inoculation diminishes after the expiration of six months.

No. 23.—A. As in No. 22. B. The average age of the inoculated was 25·4 years, that of the uninoculated 30·6. C. and D. As in No. 22.

No. 24.—A. Nominal rolls. C. and D. The classification and the facts generally were very carefully controlled by Captain W. A. Ward, R.A.M.C., who inoculated, and remained in medical charge of the regiment.

No. 25.—A. The numbers of the inoculated and uninoculated corresponds in each case with the average strength of the group for the year. B. to E. As in No. 2. F. No data. G. The statistics here in question refer almost exclusively to men inoculated in 1898, 1899, and 1900. So far as they apply to men inoculated in 1900, they confirm the statistics of that year, which showed that the protection conferred by inoculation persists during the second twelve months. So far as the statistics of 1901 refer to a residue of the 4,000 men inoculated in India in 1898–1899 they suggest that the protective effect of inoculation continues for a minimum of three years.

No. 26.—No data.

No. 27.—No data.

GENERAL CONCLUSIONS WHICH EMERGE FROM THE STATISTICAL RECORDS SET FORTH IN THE SYNOPTICAL TABLE ABOVE.

It will be well to make clear before proceeding to summarise the teaching of the statistical materials embodied in the table above that the inoculations whose results are here recorded represent inoculations undertaken for the most part in a very hurried manner, under very difficult external conditions, with imperfectly standardised vaccines, and particularly in the case of the South African inoculations, by agents who were absolutely without scientific training. Further the results here recorded were obtained for the most part by the inoculation of a single large dose of vaccine. If, as will be plain from the analysis of the results which is given below, inoculations conducted under all these disadvantages have none the less furnished clear evidence of the utility of the process, and if, as will be plain, the process has—in spite of the imperfect manner in which it has been carried out—already effected a great saving in life, it is perhaps not over-sanguine to look

forward to the achievement of a very much greater protective effect when provision shall have been made for carrying on the inoculations in a manner more in accordance with the demands of a scientific system.

For the moment, however, we are concerned, not with the future, but with what has already been achieved.

Effect which has been exerted by anti-typoid inoculation on the incidence of the disease.

A study of the statistical material will show that in every case, except that of the City Imperial Volunteers (where the statistical materials at my disposal consist only of the bald figures incorporated in the table), and in the case of the staffs of the Portland Hospital and Imperial Yeomanry Branch Hospital at Pretoria (where we are dealing with very small figures), the incidence of typhoid fever was diminished by at least one-half in the inoculated. In certain cases, notably in those to which the statistics designated by the serial Nos. 3, 4, 5, 18, and 21 apply, a greater reduction in the incidence of typhoid fever was achieved—a reduction varying from a 6-fold to a 28-fold reduction.

Effect which has been exerted by anti-typoid inoculation on the case-mortality of the disease.—Superadded to the diminished incidence of the disease there is a striking diminution of case-mortality, as is attested by the extensive statistical material collected by Dr. R. W. Dodgson (Table I., No. 13), from various Military Hospitals, and more particularly by the accurate and extensive figures obtained under the personal zealous supervision of Major C. Birt, R.A.M.C. (Table I., No. 8), and by the Medical Staffs of the Civil Hospitals (Tables I. and II., Nos. 9, 10, 11, 12, 14) in South Africa. In the aggregate the proportion of deaths to cases among the inoculated has been rather less than half that among uninoculated.

Effect which has been exerted by anti-typoid inoculation on the death-rate from the disease.—The combined effect of the diminished incidence and diminished case-mortality manifests itself in the diminished death-rate from typhoid fever among the inoculated. The minimum reduction of death-rate chronicled in the table is the twofold diminution in the case of the City Imperial Volunteers. As will be seen, the reduction of death-

rate in case of the inoculated has often exceeded, and has seldom fallen below, a four-fold reduction.

Duration of the protection which is conferred by anti-typhoid inoculation.—The only definite statistical evidence which is available for the decision of the question as to the duration of the protective effect exerted by anti-typhoid inoculation is to be found in the statistical returns of the year 1900, relating to the British Garrisons in India and Egypt respectively. (Synoptical Table, Nos. 6 and 5.) This evidence, so far as it goes, points to the persistence of the protective effect during the second year after inoculation.

The statistics relating to the British garrison in India (Synoptical Table, No. 25) for the year 1901 make it probable that the effect of the inoculation persists during the third year.

Attention may be directed in this connection to two series of laboratory observations which afford a certain amount of support to the conclusions just arrived at:—

(a) It is not infrequent to find an agglutinative power in the blood of inoculated persons as long as two years after the inoculation of anti-typhoid vaccine.

(b) Von Dungern's experiments¹ in connection with rabbits inoculated with crab's blood have shown that even after the specific antitropic substances which have been produced by inoculation have disappeared from their blood, the inoculated animals retain a power of responding more rapidly and more effectively to a renewal of the vaccinating stimulus.

CONCLUDING REMARKS WITH REGARD TO THE PAST AND THE FUTURE OF ANTI-TYPHOID INOCULATION IN THE BRITISH ARMY.

I had intended to complete this paper by narrating the singularly characteristic inner history of this endeavour to reduce the death-rate from typhoid fever in the British Army. I find that it may contribute to the advancement of the cause I have at heart, if I postpone putting on the mantle of the historian.

¹ *Loc. cit.*



ON BLACK URINE.

By ARCHIBALD E. GARROD, M.A., M.D., F.R.C.P.,

Assistant Physician to St. Bartholomew's Hospital; Physician to the Hospital for Sick Children, Great Ormond Street.

THAT urine is sometimes black was one of the earliest recorded facts of clinical medicine. In the Κρακαὶ Προγνώσιες, a work which is believed to be older than the time of Hippocrates, and to be a source from which he drew some of the facts which he set down in his own writings, blackness of the urine is spoken of as a symptom of fatal significance, “δλεθρὸν δίστη τῶν οὐρῶν τό τε μέλαιναν τὴν ὑπόστασιν ἔχον καὶ τὸ μέλαν.”¹ Hippocrates himself makes a like statement in his Προγνωστικόν,² and Galen too,^{3,4} in several passages in his works, lays stress upon the evil prognostic import of this sign. These authors had so large a share in shaping the tenets of the medical profession in the Middle Ages that it causes no surprise to find their views upon this point often quoted by later authors, nor that it became the accepted view among practitioners that when black urine is passed a fatal issue is not far off.

In the writings of medical authors of the sixteenth and seventeenth centuries a number of references to the subject are to be found, and cases are related in order to show that blackness of the urine is not always of such grave import as the statements of Hippocrates and Galen would imply. There is still but little discrimination of the several causes to which the phenomenon may be due, and in most of the records the data given are too scanty to furnish a basis even for plausible conjecture as to their nature. In some of the cases the abnormal colour of the urine was clearly due to admixture of blood or of haemoglobin; in some it was associated with “black jaundice,” and may be set down to bile-pigment; and in others again it was attributed to the eating of certain fruits, such as damson plums or grapes. I have found no instance in which there are grounds for a diagnosis of true melanuria

anywhere earlier than Fawdington's paper on Melanotic Sarcoma, published in 1827.*

Most interesting is a group of cases in which black urine was passed, over long periods, by persons who appeared to be in perfect health; and the gem of this series is to be found in the pages of *Zacutus Lusitanus** (1649), where there is given an instance of the life-long excretion of black urine without detriment to health. When the patient had reached the age of 14 years an active course of treatment was embarked upon, on the supposition that the fault lay in a "fiery heat" of his internal organs, which caused charring and blackening of the bile, and which, if left untreated, might lead to irre-mediable mischief. Accordingly every means which could be thought of to subdue the internal fires was adopted, such as purgation, bleeding, baths, a cold and watery diet, besides drugs innumerable. All these measures alike failed to bring about the desired result, and in spite of them all the boy continued to enjoy good health. At length, having lost confidence in remedies, he let things take their course and lived his life untreated. To the surprise of his medical advisers the predicted evils did not ensue; he married, begat a large family, and lived on for many years in good health, but still passing urine as black as ink.*

Gulielmus Adolphus Scribonius,⁷ in his diatribe against those who pretended to diagnose diseases from inspection of the urine, cites the case of a schoolboy who, although he suffered from no illness, passed urine so black as to look like ink; and *Schenkius*⁸ quotes from *Johan Bellfortis* the case of a

* "Septennis puer, quum in omnibus sanorum munia exqueretur, undecim annis eminxit urinam nigrā, atramenti scriptorii instar, et cum nullum edulium sumeret ob quod urina nigredine conspurcaretur ut sepe contingit, rationabilius erat ex viscerum igneo calore humorem biliosum aduri, et in nigredinem verti. Quare ne hic in aliquem lapsum immedicabilem ex siccitate subortum incideret, in xiv anno constitutus, remedia exposcit. Multa fuere oblata quæ jecur, a quo, tanquam a communi officinâ, hoc vitium emanare medici rati sunt, attemperarent, unaque illius phlegosim retundere nata essent. Expurgatum sæpius corpus, præmissâ phlebotomiâ, serum lactis exhibuit, observata frigida et humida diæta. Imperatum balneum et alia innumera fere oblata in potum, quæ igneum viscerum intemperiem corrigerent: tandem cum nullis auxiliis levaretur, ipsa sanorum munia obiens, medicamentorum jam impatiens, ab eis destitut, et quod mirum est, nullâ siti aut oris amarore oppressus, vitam sanissime ducebat. Hic nupsit, et fæcundâ fuit factus prole beatus, et in multos annos, hanc emittens urinam, vitam produxit."

monk who passed black urine throughout the six years during which he was under observation, and who stated that he had done so all his life.

The most probable explanation of these cases which can be advanced is that they were examples of alkapturia, although there are some other rare conditions in which dark urine may be passed for years or even throughout life. The objection that there is nothing in the accounts which suggests that the blackness of the urine only developed on standing, loses some its force from the fact that in no writings earlier than the beginning of the nineteenth century have I found any such distinction drawn between the two classes into which the black urines with which we are familiar naturally fall, namely, those which are black when passed and those which only darken later.

In this connection a paper by Alexander Marct,⁹ read in 1822, is of great interest. The case which forms its subject was almost certainly one of alkapturia in an infant. The urine appeared natural when passed, but blackened on standing or when an alkali was added to it ; the child's napkins were deeply stained, the black pigment had the required properties, and evidence of reducing-power is alone wanting. A second case which is referred to in the same paper is of no less interest, for, although the nature of the pigment was not recognised, no one reading the description can doubt that it was one of paroxysmal haemoglobinuria with Raynaud's disease. This publication called forth the records of some other cases the nature of which is far from being so evident.¹⁰

Not long after, in 1827, Fawdington laid the foundation of the differential diagnosis of black urines in a paper on melanotic sarcoma to which reference has already been made.

At the present time we are more or less familiar with a number of conditions in which the urine may, either when passed or after standing for a time, be so dark that without abuse of terms it may be styled black. In the majority of instances such urines appear of a deep-brown or red colour when seen in thin layers, and black only in deeper layers ; only in a few conditions, such as melanuria and alkapturia, is true blackness attained to, and in them only after exposure to air.

Both from the points of view of diagnosis and of prognosis it is important to have an acquaintance with these conditions and with the tests by which they may be distinguished from each other. It is not easy to make a satisfactory classification of them, nor can a rigid line be drawn between conditions in which the urine may be black when passed and those in which it becomes so on standing, seeing that in some of those of the latter class, the colour may be conspicuously dark from the first, and may merely become intensified on exposure to the air. The following list fulfils the requirements fairly well.

Urine which is black or which becomes black may be excreted :—

1. In cases of jaundice, especially when of long standing.
2. " " " haematuria.
3. " " " haemoglobinuria.
4. " " " haematoporphyrinuria.
5. " " " melanotic sarcoma.
6. " " " alkaptonuria.
7. " " " ochronosis.
8. " " in which abundance of indican (indoxyl-sulphate) is present.
9. " " of phthisis, only after standing for a long time.
10. " certain rare cases of undetermined nature.
11. After the taking of certain drugs and articles of diet (including carboluria).

In cases of pernicious anaemia the urine, which is rich in urobilin, may have a dark-brown colour, but it can seldom, if ever, be called black. In malarial cachexia the black pigment which is present in the blood may find its way into the urine in a particulate form and appear as a black sediment; and black sediments may also consist of indigo-blue or of deeply-tinted uric-acid crystals, as in carboluria.

It will be well to consider briefly each of the varieties mentioned in the above list, in turn.

1. *Jaundice*.—It is not common for urines containing bile-pigment to approach to blackness, but they may appear black when they contain biliverdin in considerable amount together with bilirubin and other varieties of bile-pigment. Black urines of this kind are more common in cases of long-standing jaundice, in which the skin has acquired a dirty greenish hue.

This variety is little liable to be mistaken for any other, owing to the deep jaundice of the skin, and the ordinary tests for bile-pigment will at once reveal its nature. The cases in which, owing to the formation of a fistulous channel between the biliary and urinary passages, much bile-pigment finds its way into the urine, although there is no jaundice of the skin, are so very rare that for practical purposes they may be neglected.

2. *Hæmaturia*.—It is probable that many of the black urines described in the earlier literature owed their blackness to the admixture of blood or of hæmoglobin, as, for example, in a case of renal tumour described by William Cooper in 1695.¹¹

The blackness in such cases is merely an exaggeration of the smoky tint which is so familiar, and which is due to the presence of much of the contained blood-pigment in the form of methæmoglobin. Besides yielding the ordinary chemical and microscopic tests for blood, such urines, if examined with the spectroscope in thin layers, show the dark absorption-band in red of methæmoglobin, and usually those of oxyhæmoglobin also.

3. *Hæmoglobinuria*.—The term “blackwater fever” bears witness to the character of the urine, which may result from the presence of hæmoglobin; and in the paroxysmal hæmoglobinuria with which we are familiar in this country, as well as in cases of poisoning by such drugs as potassium chorate and arseniuretted hydrogen, the urine may appear opaque and practically black, with an abundant chocolate-coloured deposit. As has been mentioned, the appearance in Alexander Marcet’s case does not appear to have suggested to him the presence of blood-pigment.

4. *Hæmatoporphyrinuria*.—In this condition the colour of the urine usually resembles that of port-wine, but every degree of tint is met with between a tawny pink and practical blackness. These differences are far less due to the large quantities of hæmatoporphyrin present than to other dark abnormal pigments which are apt to accompany it, and which, as they yield no characteristic spectra, have as yet been but little studied.

In a case which was under the care of my colleague Dr. Calvert¹² I was able to remove the hæmatoporphyrin without materially affecting the colour of the urine, which was

mainly due to an unstable purple pigment which was also isolated from it. Moreover, anyone who will try to reproduce the appearance of such specimens by the mere addition of hæmatoporphyrin to normal urine, until absorption-bands of similar intensity are shown by it, will have no difficulty in convincing himself of the correctness of the above statement.

Of the many cases of hæmatoporphyrinuria which have been described of recent years, the great majority have been due to the toxic action of sulphonal or its allies, often manifested only after the drug has been taken over long periods.

Very rarely a similar profound disturbance of pigment-metabolism has been met with apart from the use of sulphonal or trional, and in several cases¹³ the anomaly was believed to have been present for many years before the patients came under observation. In a remarkable case recently recorded by J. Pal¹⁴ a paroxysmal hæmatoporphyrinuria was observed, with symptoms like those of paroxysmal hæmoglobinuria.

The recognition of such urines rests upon the observation of the spectroscopic absorption-bands of hæmatoporphyrin ; and as they usually contain no albumen, the presence of hæmoglobin can readily be excluded. The spectroscopic appearances, taken alone, may mislead anyone not familiar with the condition, for in some cases, in place of the ordinary bands of alkaline hæmatoporphyrin, the so-called "metallic spectrum" is seen, which consists of two dark bands which closely resemble those of oxyhæmoglobin. Urine, whatever its reaction, never shows the spectrum of acid hæmatoporphyrin unless a mineral acid has been added to it.

5. *Melanuria*.—True melanuria, associated with melanotic sarcoma, is a rare condition, for melanotic sarcoma is itself an uncommon disease. My own observations bear out those of others as regards the following points :—In cases in which the growth is limited to its primary seat, or to a neighbouring group of lymphatic glands, melanin, or rather its chromogen melanogen, is not found in the urine. Only when the internal viscera have become involved does melanuria result. The amount of melanogen excreted appears to be proportional to the degree to which the liver has been invaded, and to the quantity of pigment in the growths in that organ.

It has often been stated that melanuria may occur apart

from melanotic growths, but I have never obtained the characteristic reactions except in cases in which such growths were undoubtedly present; nor are the published cases which are usually quoted in support of this statement by any means conclusive.¹⁵ It is highly probable that the darkening of urines rich in indican has not infrequently been mistaken for true melanuria.

In melanuria the urine has usually a normal colour when passed, but it may have a brown tint, and in one recorded case was passed black. On standing exposed to air, it quickly becomes brown, and ultimately as black as ink. The darkening takes place from the surface downwards.

The addition of nitric acid to the cold urine at once produces blackness. Ferric chloride also causes immediate blackening, and a grey precipitate which forms is redissolved by excess of the reagent. This test, introduced by von Jaksch, is the most characteristic and delicate one for melanogen which we possess, and unless a positive result is obtained with it, the diagnosis of melanuria is not justified. It has too the advantage that, unlike the nitric acid test, it is not yielded in the conditions which most closely simulate melanuria. Zeller's test—the formation with bromine water of a yellow or brown precipitate which quickly blackens—is also valuable, but is not so delicate as the ferric-chloride test. I have known it to fail when the quantity of melanogen present was very scanty.

As von Jaksch has further shown, these urines yield a deep-blue product (Prussian blue) when treated with sodium nitro-prusside and caustic potash and acetic acid. This reaction is not peculiar to melanuria, nor is it due to melanogen, but nevertheless it serves as a useful adjunct to the ferric-chloride test.

6. *Alkaptonuria*.—In alkaptonuria, as in melanuria, the urine has the normal colour when fresh, but darkens, from the surface downwards, on standing, passing through various shades of brown to absolute blackness. The change follows much more rapidly when an alkali is added, *unde nomen alkapton*. One striking property of such urine is that of deeply staining any fabric which may be wetted with it, and the peculiarity is therefore readily noticed in infancy.

Alkaptonuria is an extremely rare anomaly of proteid

metabolism, usually congenital and lifelong, and one which appears to be harmless. Of the recorded cases a number have occurred in brothers and sisters; only two instances of direct transmission from parent to child are known, and a large proportion of the known alkapturonics have been the offspring of consanguineous marriages. It is probably to be regarded as a "recessive" character, in the sense in which that term is used by Mendel and his followers,¹⁶ latent in certain families, and more apt to appear when members of such families intermarry.

As far as our knowledge goes, the alkapturic differs from the normal individual in that in him tyrosin and phenyl-alanin (products of proteid katabolism) do not undergo complete destruction in the ordinary way. The benzene-ring of these compounds, which is normally broken up, passes unchanged through the alkapturic organism, and appears in the urine in the form of homogentisic (hydroquinone-acetic) acid, which is not improbably an intermediate product of normal metabolism. In a few cases a second aromatic acid (uroleucic) has also been found in the urine.

The condition is recognised by the characters already described, and by the fact that the urine reduces Fehling's solution with the aid of heat, and ammoniacal silver-nitrate solution in the cold. Hence alkapturonics are liable to be mistaken for diabetics.

The urine does not yield Nylander's test for sugar, nor does it rotate the polarised ray. To recognise alkapturia with certainty homogentisic acid must be extracted from the urine. It may be obtained without difficulty in the form of its lead salt,¹⁷ or as ethyl-homogentisate.¹⁸ The former may be identified by estimating the water of crystallisation or the contained lead, the latter by its melting-point and other properties.

In some of the earlier cases the properties of the urine were ascribed to pyrocatechin, but no case of pyrocatechinuria simulating alkapturia has been described since the discovery of homogentisic acid by Wolkow and Baumann.

7. *Ochronosis*.—This name was given by Virchow, in 1866, to a blackening of the cartilages, and of some other tissues, met with *post mortem*, in the case of an old man who died of aortic aneurysm. A second case was described by Boström in

1891, a third by Hansemann in 1892, two more by Heile in 1900, a sixth by Hacker and Wolf, and a seventh by H. Albrecht.¹⁹ No case has yet been recorded in this country, and ochronosis is evidently extremely rare.

In three cases the urine has been observed to blacken on standing. In that of Hansemann it was brownish when passed, and the peculiarity had been noticed for 18 years before the patient's death. Salkowski found at the time that the urine did not yield the reactions of true melanuria, and Langstein, who has recently examined a long-kept specimen, found that it had none of the characters of alkaptone urine.

In Hacker and Wolf's case the condition of the urine had been noticed intermittently for eleven years. It did not reduce Fehling's solution, and the authors concluded from the reactions obtained, including a blackening with ferric chloride, that the pigment was of the nature of melanin.

Albrecht's patient, a man aged 47, died of pulmonary tuberculosis. His urine of a brown colour when passed, and darkened on standing. It reduced Fehling's solution and ammoniacal silver nitrate, the latter in the cold. Although Zdarek was not able to obtain homogentisic or uroleucic acid from it, it was held that the coloration of the urine was due to derivatives of these acids, and that ochronosis was probably closely related to alkaptoneuria.

In Hacker and Wolf's case there were flecks of pigment in the conjunctivæ, and Albrecht describes a peculiar blueish pigmentation of the hollows of the ears, such as would be caused by dilated venules. Osler,²⁰ in a recent paper, has described an exactly similar appearance of the ears, and pigmentation of the conjunctivæ, in two elderly alkaptoneuric brothers, whose cases were originally recorded by Marshall and Futcher respectively. In one case there was conspicuous pigmentation of the skin of the face also. Osler adds that in a third American case (Ogden's) a like pigmentation is developing with advancing years.

At this point the question of the nature of the dark urine of ochronosis must be left for the present. In two of the recorded cases alkaptoneuria may practically be excluded, and in no case in which ochronosis of the cartilages has been demonstrated *post mortem* has the existence of alkaptoneuria been definitely

established. On the other hand, whilst it has been shown that external appearances, such as have been present in some cases of ochronosis, appear in some elderly alkapturonics, in none of these has the pigmentation of the cartilages yet been demonstrated *post mortem*, and in the few records of autopsies of cases of alkapturia there is no mention of such pigmentation. If, as Osler's cases render it highly probable, alkapturia be a cause of ochronosis, it can hardly be the only cause.

8. *Indicanuria*.—We have now to consider a kind of dark urine which, although it is among the commoner ones, is not nearly so well recognised as it should be. From this very fact it acquires importance, for a careful study of the literature of black urine serves to convince one that it has often been mistaken for other conditions, and notably for true melanuria.

Uries very rich in indoxyl-sulphate often have a brown colour which becomes much intensified on standing. This colour is not due to the indigo-pigments, nor to indoxyl-sulphates which are colourless substances, but, as Baumann and Brieger showed, to higher oxidation-products of indol. The pigment belongs to the group of brown or black oxidation-products of aromatic compounds.

Good examples of such urines will be found described by Senator,²¹ Pearce Gould,²² and S. Pollak,²³ amongst others; and in the cases which are often quoted in support of the view that melanuria may occur apart from melanotic growth, the presence of much indican in the urine was specially noted. In any case in which a dark urine of doubtful nature is passed, the possibility of its being of this variety should be considered and excluded.

Such urines blacken when warmed with nitric acid, but there is no such immediate blackening in the cold as with true melanuria. They do not blacken with ferric chloride, and by this test they may be at once distinguished from those containing melanogen. Confirmation is afforded by heating with hydrochloric acid and a drop of nitric acid or of a dilute solution of bleaching powder. On shaking with chloroform the indigo pigments so formed are readily extracted, but the supernatant liquid retains an inky blackness. Such urines do not reduce Fehling's solution.

Any morbid process which leads to abundant excretion of indican may give rise to such urine, as, for example, intestinal obstruction from any cause, excessive bacterial activity in the intestine, or putrefactive changes in collections of pus.

9. *Cases of Phthisis*.—Hale White²⁴ found that in some cases of phthisis the urine remained acid even when kept for days or weeks in contact with the air, and sometimes became brown or ultimately quite black on long keeping. This change, which usually requires a month or more for its completion, is not strictly comparable with the other conditions which we have been considering. The nature of the dark pigmentation was not made out, but one is tempted to connect it with the increased excretion of phenols, which has been found by Blumenthal²⁵ in cases of advanced phthisis in which active decomposition changes are going on in the cavities.

Black urines with tubercular disease have been described by other authors, but these seem to have been usually examples of indicanuria, which is specially apt to occur in cases of abdominal tuberculosis.

10. *Certain Cases of uncertain Nature*.—The cases now to be referred to, standing alone as they do, are at present little more than clinical curiosities. Probably they are merely the first recorded examples of what will, at some future time, come to be well-defined, but rare, pathological conditions, and from this point of view it is important that they should not be lost sight of.

A well-known case is that of Leube²⁶ recorded in 1886. The patient was a woman, aged 76, who suffered from osteomalacia, cystitis, and nephritis. The urine, which was not obviously dark when passed, became black on exposure to air. This peculiarity could not be ascribed to any food or drug taken, and no cause for it was found *post mortem*. From the urine a dark-purple pigment was readily extracted by shaking it with ether.

H. A. Schölberg²⁷ investigated the urine of a man, aged 28, who suffered from peripheral neuritis. Although it appeared natural when passed, it quickly darkened on standing, and passed through various shades of purple-red to actual blackness. The pigment and its chromogen could be precipitated with baryta-mixture, but neither could be obtained in a pure state.

Unlike Leube's pigment, it was not soluble in ether, and all the known varieties of black urine could be excluded in turn. The possibility of ochronosis was thought of, but the pigment more nearly resembled the unknown ones of haemato porphyrinuria. Haemato porphyrin was present, but in no larger quantity than in many morbid urines. This case, which I also had the opportunity of watching, gained in interest from the fact that the man stated that his urine had shown the same peculiarity all his life; and Schölberg found the same pigment, in small quantities, in the urine of the father and sister of the patient.

11. *After certain Articles of Diet and Drugs* (including carboloria).—Reference has already been made to cases in the earlier literature in which blackness of the urine was ascribed to the eating of certain fruits, such as damson plums. It is also stated as an ascertained fact that some dark-coloured vegetable pigments, such as those of bilberries and black cherries, are excreted in the urine. I have no experience of black urines due to such causes, and some medical friends living in districts in which bilberries abound tell me that such an effect of eating that fruit has not come under their notice. It is possible that darkening of the urine after the copious eating of vegetable foods may occasionally result from the presence of such substances as pyrocatechin and hydroquinone. It is a fact which has long been known that from arbutin contained in the leaves of the *Uva ursi* hydroquinone is formed, and may cause conspicuous darkening of the urine of patients who are taking that drug. A like result follows the administration of the third isomeric dioxybenzene, namely, resorcin.

The greenish-brown colour of carboloria, which may amount to actual blackness on standing or in cases of carbolic-acid poisoning, is also ascribed to hydroquinone, formed from phenol in its passage through the body. Children develop carboloria very readily, and it is often seen in them after the application of a compress to the scalp for the destruction of pediculi. The diagnosis of carboloria seldom offers any difficulty, provided that the fact that carbolic acid has been administered, taken, or applied to the surface of the body, is known. In such urines the addition of barium chloride produces little or no precipitate, seeing that all or nearly all the sulphuric acid present is in the form of aromatic

sulphates ; but after boiling with hydrochloric acid, which breaks up the aromatic sulphate, a copious precipitate of barium sulphate is obtained. The colour-reaction of phenol with ferric chloride is not obtained in cases of carboloruria.

Other drugs belonging to the aromatic class, such as naphthalin, salol, creasote, thallin, and in a less degree the salicylates, cause darkening of the urine which may attain to blackness. A dark purple-red colour may be seen in *alkaline* urines after the administration of rhubarb or senna in large doses. This is due to the chrysophanic acid which these drugs contain, but I have never seen such a urine which approached to blackness. It is important that pigmentation from such causes as the above should be carefully excluded in any doubtful case, and to do this is not always so easy as one might expect.

As a curiosity, a case which Loebisch²⁰ quotes from Grassi may be alluded to, that of a man with a recto-vesical fistula, whose urine was rendered black by sulphide of bismuth derived from the bowel.

It will be evident from the summary here given that it is necessary to be acquainted with a number of different conditions which may lead to the passing of black urine, and with the means of distinguishing one from another, before one can form an estimate of the diagnostic import of the sign in any given case. From the point of view of prognosis the same holds good, for whereas the occurrence of true melanuria is an event of the worst omen, as indicating the recurrence of melanotic growths in the viscera, an equal degree of blackness is reached in alkapttonuria, which, as far as we know, is a quite harmless condition. Between these extremes are morbid conditions of various degrees of gravity which are attended by the excretion of urine which, either when it is freshly passed or after it has stood for a time, may fairly be described as black.

REFERENCES.

- ¹ Κυακαι Προγνωσίες, sect. vii., par. xxxiv., p. 569.
- ² Hippocrates : Προγνωστικόν, 12.
- ³ Galen : Περὶ Κρισίων, Bk. I., Caps. V. and XII.
- ⁴ Galen : Περὶ Οὕρων, Cap. VIII.
- ⁵ Fawdington : *A Case of Melanosis, &c.* London, 1827.

- **Zacutus Lusitanus** : *Praxis Medica Admiranda* (1649), Lib. III., Ch. CXXXIV.
- **G. A. Scribonius** : *De inspectione urinarum* (1584), p. 50.
- **Schenklius** : *Observationes Medicae*. Frankfort, 1609. Lib. III., p. 558.
- **A. Marcket** : *Medico-Chirurgical Transactions*, 1823, XII., p. 37.
- **London Medical Repository**, 1822, XVIII., pp. 161 and 380.
- **William Cooper** : *Philosophical Trans.*, 1695, XIX., p. 301.
- **J. Calvert** : *Clinical Soc. Trans.*, 1901, XXXIV., p. 41.
- **Sobernheim** : *Deutsche Med. Wochenschr.*, 1892, XVIII., p. 566. **McCall Anderson** : *British Journ. of Dermatol.*, 1898, X., p. 1. **Nebelthau** : *Zeitschr. f. physiol. Chemie*, 1899, XXVII., p. 324.
- **J. Pal** : *Zentralbl. f. innere Med.*, 1903, XXIV., p. 601.
- **Leichtenstern** : *Ziemssen's Handbuch*, 1880, 2nd edit., VIII., i., p. 343. **Litten** : *Deutsche Med. Wochenschr.*, 1889, XV., p. 41.
- **Bateson** : *Mendel's Law of Heredity*, Cambridge, 1902.
- **Wolkow and Baumann** : *Zeitsch. f. physiol. Chemie*, 1891, XV., p. 228.
- **E. Garrod** : *Journ. of Physiology*, 1869, XXIII., p. 512.
- **Erich Meyer** : *Deutsches Archiv. f. Klin. Med.*, 1901, LXX., p. 443.
- **H. Albrecht and Zdarek** : *Zeitschr. f. Heilkunde*, 1902, XXIII., pp. 366 and 379. References to the earlier cases are given in these papers.
- **Osler** : *Lancet*, 1904, I., p. 10.
- **Senator** : *Charité Annalen*, 1890, XV., p. 261.
- **Pearce Gould** : *Clinical Soc. Trans.*, 1898, XXXI., p. 47.
- **S. Pollak** : *Berliner klin. Wochenschr.*, 1892, XXIX., p. 688.
- **Hale White** : *British Med. Journal*, 1892, I., p. 1070.
- **Blumenthal** : *Pathologie des Harns am Krankenbett*, 1903, p. 209.
- **Leube** : *Virchow's Archiv.*, 1886, CVI., p. 418.
- **H. A. Schölberg** : *Trans. Pathol. Soc.*, 1902, p. 279.
- **Loebisch** : *Anleitung zur Harn-Analyse*, 1881, p. 24.



ON A SERIES OF CASES OF CANCER OF THE MOUTH AND FAUCES.

By STANLEY BOYD, M.B., F.R.C.S.,

Surgeon to the Charing Cross Hospital, and to the Hospital for Consumption and Diseases of the Chest; and

W. H. UNWIN, M.D., F.R.C.S.,

Late Demonstrator of Anatomy, Charing Cross Hospital.

IN the May number, 1903, of *THE PRACTITIONER*, we gave an account of our cases of cancer of the tongue and its frænum during the twelve years 1891-1902 inclusive: to complete our contribution to the subject to which that number was devoted, we now record our cases of cancer occurring elsewhere in the mouth. Before doing so, however, we must note that since May, 1903, No. 24 of the tongue-cases, then regarded as free from cancer, has been found to have inoperable recurrence in the cheek.

As in our first paper, so here, we give a full account of our cases, in chronological order, in an appended table, reference to which is necessary to follow our remarks.

EPITHELIOMA OF THE INNER SURFACE OF THE CHEEK.

In two cases (Nos. 2 and 7), both men, a considerable area in front of the wisdom-tooth was affected. Treatment consisted in dividing the skin of the cheek backwards from the angle of the mouth sufficiently to expose the whole growth, which was then excised, together with all the tissues deep to the skin. In both cases long immunity has resulted—in No. 2, four years and eight months up till July, 1903, but the amount of leucoplakia upon both cheeks indicated danger. He has not been seen since. In No. 7, three years after the first operation, an epithelioma of the lower lip appeared and increased rapidly, so that in October, 1903 (6 weeks), most of the left half of

[Continued on page 404.]

EPITHELIOMA OF

No.	Sex.	Age.	Duration.	General Condition.	Local Condition.	Glands.
1. 1893, Nov.	F.	58	4 months slight pain in swallowing and lump inside. 3 weeks lump below jaw.	?	½ in. ulcer far back on right cheek adherent to toothless lower alveolus and root of coronoid process, not reaching maxilla.	"Half-walnut" mass fixed to jaw; small gland over edge of sternomastoid.
2. 1893, Nov.	M.	40	4 months sore mouth and white spot inside right cheek. 3 months carious right upper molar removed.	Good.	Ulcer on right cheek ½ in. back from angle of mouth and ¼ in. down from upper fornix; marked leucoplakia behind it; skin normal.	No note. "Some of those removed were infected (microse.)
3. 1893, Dec.	M.	63	8 years "wart" inside cheek. Slow growth till 6 months ago. 6 weeks lump at angle. Teeth all lost 15 years.	Good.	Growth inside left cheek from 1 in. from angle of mouth nearly to anterior pillar, adherent to coronoid process; it slightly involves hard palate and thence passes down to lower alveolus in molar region, involving inner surface of jaw more and more as it is traced back towards angle. Cheek swollen from molars down to angle of jaw near which a bit of skin is involved.	Several large submaxillary glands.
4. 1893, Dec.	F.	38	5 months soreness about left lower jaw.	Good.	Three months ago was operated on by another surgeon through a curved cut over left angle of jaw; neither bone nor glands touched. Now sinus in centre of scar; gape somewhat limited; left lower jaw toothless. Ulcer from bicuspid region up on to front of coronoid process, just involving floor of mouth, but not that of outer sulcus. Beneath unchanged mucosa of cheek, a 1 in. long oval mass continuous with ulcer and jaw.	An adherent submaxillary mass. No glands in parotid or upper carotid region.
5. 1900, July.	M.	62	? Attributed to 8 years' irritation by broken molar. Recently skin involved and burst through. One week—glands below jaw.	Losing flesh.	Cheek swollen, red, infiltrated, discharging "pus." Large mass occupies inner surface from outer surface of upper almost to lower alveolus, and from ½ in. behind angle of mouth to edge of coronoid. Fixed to maxilla and malar (?). Total mass "half orange," 1½ in. diameter.	No note.
6. 1900, Aug.	F.	57	2 months—lump inside. 6 weeks pain.	Fat.	No teeth. Ulcer on right lower molar alveolus, nearly reaching coronoid, involving cheek slightly behind and filling up outer sulcus; not reaching inner side of alveolus. Hardness felt through cheek.	No note.
Dec.	—	—	1 month.	—	No present state in notes	—

GUM AND CHEEK.

Operation.	Recurrences.	Result.
Glands felt removed: large mass burst into wound. Mouth gagged open, ulcer outlined with knife and clipped out with scissors. Access unsatisfactory.	—	Lost sight of.
Kocher's cut; limb along sternomastoid prolonged down to $\frac{1}{4}$ in.: all glands in this area removed. Cheek divided $\frac{1}{4}$ in. back from angle of mouth: Growth circumscribed and removed, with all tissues of cheek except skin. Skin and mucosa saturated, leaving $\frac{1}{4}$ -gap in latter.	—	July, 1903 ($\frac{1}{2}$ years). Gape normal, fine scar on cheek. Marked leucoplakia of both cheeks, especially along line of bite. On right a small firm white "wart" at one point of scar. This was removed. There was no downgrowth of epithelium: only round-celled infiltration deep to the epithelium mass.
Submaxillary cut. Submaxillary and upper carotid glands removed. Involved skin circumscribed. Lip and chin divided and left cheek reflected, except infected skin and mucosa. Left jaw sawn well in front of growth and removed by exarticulation, together with growth on cheek, alveolus, and hard palate. Some bits of bone came away later.	—	March, 1903 ($\frac{1}{2}$ years). In excellent health. Quite free from recurrence. Chin deviates very little and whisker conceals depression over left jaw. Mouth open fully. No notching of lip. Jan., 1904 (4 years, 1 month), quite well.
To excise sinus it was necessary to use old scar and to extend thence along lower edge of jaw, instead of using Kocher's cut. Submaxillary mass (salivary and lymph-glands matted) removed with parts of digastric, mylohyoid and periosteum of jaw: gland burst and flooded wound: sponged with 1:20 carbolic. Nothing left in upper carotid region. Lip and chin split; cheek turned back; sinus and mass cut out; jaw removed from canine level to line from root of coronoid to angle, and then whole front of coronoid split off vertically with bone forceps. Incision noted as "very inconvenient."	In 2 months (December, 1900) recurrence began near angle of mouth and has extended to upper lip, across midline of lower and far back in cheek. Large mass beneath left sternomastoid and some on right side. Deformity due to operation marked. Chin fell over to left, scar was rather striking, lower lip centrally notched.	Inoperable recurrence; its commencement near the angle of the mouth, which was not near the primary disease, was hard to explain.
Kocher's cut. Submental, submaxillary and upper carotid glands, from digastric to thyroid cartilage removed. Growth circumscribed outside and inside—removed, being elevated from surface of maxilla. Hole left in cheek after suturing.	—	Died on 6th—"septic bronchitis." Large fetid cavity at left apex. Temperature always intermittent. Nothing found in chest on 46th.
Kocher's cut. Submaxillary and upper carotid glands removed—one of latter was large. Cheek slit back 1 in. from angle, growth outlined and removed. $\frac{1}{2}$ in. in depth of exposed alveolus and coronoid removed with forceps and chisel. Mucosa sewn together.	In $\frac{1}{2}$ months precoronoid ulcer.	—
Ulcer removed with a bit of tongue towards which it tended; apparently no bone.	—	March, 1903 ($\frac{1}{2}$ years), quite well. Mouth seems to open fully. January, 1904 (3 years, 1 month), quite well.

C C

No.	Sex.	Age.	Duration.	General Condition.	Local Condition.	Glands.
7. 1900, Aug.	M.	43	6 weeks' pain.	Good.	Growth inside left cheek $\frac{1}{2}$ in. by $\frac{1}{4}$ in., raised $\frac{1}{2}$ in. Reaches from angle, where it involves upper lip to second molar. Neither sulcus involved.	A fibert-sized submaxillary.
— 1903, Oct.	—	—	6 weeks' growth in lower lip.	—	Rapidly growing epithelioma of lower lip. Most of left half of lip affected, but left edge of ulcer separated from old scar by $\frac{1}{2}$ in. Apparently unconnected with original growth.	—
8. 1900, Aug.	M.	60	12 weeks or less.	Strong : fat.	Ulcer ($\frac{1}{2}$ in. by 1 in.) inside left cheek, extending from $\frac{1}{2}$ in. from coronoid process forward to biscupid region; upwards it rises above level of crowns of teeth, downwards obliterates sulcus, and occupies base of coronoid. Base adherent.	One left submaxillary, size of fibert.
— 1900, Feb.	—	—	—	—	Only slight separation of incisors possible. Dense cicatrical band between jaws in molar region. Behind this, ulceration seen with dental mirror	No note.
9. 1901, July.	M	50	2 months' pain about lower right third molar. Tooth removed : did not heal.	Strong : fat.	Right cheek swollen. Ulcer from socket of third lower molar $\frac{1}{2}$ in. up coronoid process; in on to tuberosity of maxilla and slightly on to soft palate; down and in across sulcus just on to side of tongue; out on to cheek where ulcer is deepest and seems to burrow into and under masseter.	No glands fat.
10. 1901, Nov.	M.	56	3 weeks' neuralgia in left face; difficulty in open- ing jaw, and sore on root of mouth.	Very ema- ciated; out of all propor- tion to local disease.	Can separate incisors $\frac{1}{2}$ in. Ulcer on posterior end of left upper alveolar process, extending on to cheek and on to soft palate. No sign of infection of antrum.	None fat.
11. 1902, May.	M.	52	2 months' swelling inside left cheek. 3 weeks' limited movement.	Strong : fat.	Left cheek full. Gape under 1 in. Hard ulcer on left cheek, spreading on to upper alveolar process, soft palate, coronoid process.	One ; left sub- maxillary. Fulness beneath upper end of sternomastoid. (Of these, first only infected.)

Operation.	Recurrences.	Result.
Left submaxillary region cleared. Cheek-skin divided over growth from angle of mouth backwards, skin raised. Growth with bit of upper lip and $\frac{1}{2}$ in. margin removed. Sutured, mucosa also where possible.	—	August, 1903 (3 years), quite well. Good gape, but cheek a little tight near angle.
Right submaxillary region cleared, also submental. Lip-growth removed through V-shaped incision. Glands not affected (microscope).	Ses next line	January, 1904, quite well. No sign of recurrence of first growth (3 years, 5 months) or of second.
Kocher's cut. Submaxillary glands (3) removed. Also numerous glands deep to digastric and upper end of sternomastoid. Cheek divided from angle of mouth back to growth: ulcer outlined with $\frac{1}{2}$ in. margin, dissected from cheek, elevated from jaw and coronoid. Zinc chloride applied, wounds sutured.	In February, 1901 (6 months), neuralgia, attributed to upper molar, almost ever since operation (ses next line).	—
Cheek divided along old scar to 1 in. in front of posterior edge of ramus. Ulcer found from near lower on to upper alveolus and soft palate, and from coronoid process to back of scar; and removed, muscle and fat external to it being cut away freely, the coronoid and alveolar processes being divided with a chisel. Healed well.	Recurrence	Death in July 1901.
Kocher's cut. Submaxillary salivary gland removed, and lingual tied; no lymph-glands. These found to be all high up under cover of jaw adherent to growth in floor of mouth. Bidigital palpation further showed a rounded mass in posterior third of right base of tongue—from rather behind level of third molar, almost to epiglottis and quite up to midline. The surface of tongue was involved only where seen. Lip and chin divided in midline. Cheek flaps turned back. Ulcer outlined on cheek, maxilla and palate; dissected up from mandible with some temporal bone not bared by growth, but surface gouged away. A good wedge of jaw removed, having base on alveolar process (around infected third molar socket) and apex on free border. Ulcer in floor, adherent sub-maxillary glands and mass in base of tongue were cut away, the left side being freely trephined upon. Margin none too wide at many spots. Operation over 2 hours; no shock; upon 4th.	Recurrence took place in the cheek, but date could not be fixed. It was diffuse and inoperable. Ultimately it ulcerated through a long sinus into neck and involved many cervical glands which broke down; it invaded right face up to nose and parotid glands; broke down; masseter was infiltrated to origin; right ear became deaf. The hard and soft palate, cheek, and floor of mouth became involved, and the tongue so swollen that it filled the month.	November, 1902. Died.
Thinking the antrum was probably invaded or that part of maxilla would have to be removed to obtain access to growth behind it, the cheek was turned back from maxilla, ulcer outlined and removed with subjacent bone and part of inferior pterygoid. Antrum opened; healthy. On 4th no recurrence; jaws becoming fixed.	—	Died August, 1902 (9 months); cause uncertain. In May he was very thin and pale, and could not separate teeth at all. Esnarch's wedge and resection of jaw $\frac{1}{2}$ in. separation possible. Marked general improvement. On return home jaws again became fixed.
Kocher's cut; submaxillary and upper carotid regions cleared (4 small glands), and glands along 11th nerve removed. Lower lip and chin split; cheek reflected; wedge removed at angle of jaw to give access, and prevent closure of jaws. Growth removed with $\frac{1}{2}$ in. to $\frac{1}{4}$ in. margin, elevated from maxilla, palate, internal pterygoid, and coronoid processes.	Inflammatory swelling of cheek lasted many weeks; small sequestrum separated and sinus healed. December, 1902, well, and seemed free from recurrence; able to eat well; bite not quite true; scar in lip too plain. March, 1903, recurrence in base of tongue, and soft palate, spreading back to naso-pharynx.	Inoperable recurrence.

HARD AND

No.	Sex.	Age.	Duration.	General Condition.	Local Condition.	Glands.
13. 1897, June.	M.	47	4 months' painful ulcer on palate. Constant ache. No syphilis. Much tubercle on mother's side. Teeth sound.	Very strong and healthy.	On right palate opposite second and third molars; ulcers, size of sixpenny piece; base level with edge, which is not thickened or irregular. A smaller sore beginning behind this. Did not look at all like epithelioma (tubercular?).	None.
Oct.			—	—	October 4. Half-inch ulcer opposite third molar, extending slightly on to soft palate and out on to mucosa in front of coronoid. Neither tender nor painful. Curettings from operation in June were now examined—epithelioma.	None.
Nov. 28			—	—	—	None.
13. 1899, May.	M.	68	4 months' "sore throat."	Some loss of strength.	Ulcer size of shilling, on left soft palate, base of uvula and upper third of posterior pillar.	None felt.

LEFT LOWER GUM AND

14. 1901, Feb.	M.	57	9 weeks' loosening of left teeth.	Has been losing flesh.	Ulcerated swelling on gum from front of second lower left molar to symphysis. On right, quite distinct from above, two or three small warty ulcers on mucosa of jaw, internal to bicuspids, and an indurated mass in floor beneath sublingual fold, adherent to surrounding parts. [N.B.—We became aware of these lesions on the right side only during the operation.]	Left sub-mandibular; none along stenomastoid.
----------------------	----	----	-----------------------------------	------------------------	--	---

TONSIL AND

1. 1898, May	M.	63	6 months pain.	Good.	Typical ulcer (2×1 cm.) along right anterior pillar, extending on to palate and tongue slightly. Not infiltrating deeply.	A few hard upper carotid on both sides.
2. 1899, Jan.	M.	56	2 months stiffness of jaw and earache.	Good. Has lost flesh and strength.	Ulcer on right tonsil, both pillars and mucosa in front of coronoid process from maxilla to mandible.	Right upper carotid ("plum-stone"); a few small and soft, along posterior edge of stenomastoid in upper half.

SOFT PALATE.

Operation.	Recurrences.	Result.
Curetted; bone left bare, but smooth and hard. Iodoform. Healed quickly.	About September 20; recurrence <i>in loco</i> .	—
Ulcer circumscribed, first and second upper molars drawn, subjacent alveolar process, lower end of pterygoid process and bit of bony palate removed with chisel and mallet. Antrum slightly opened. Normal.	The wound did not heal. In November, 1897, cocaine and excision of fragment from centre — pure epithelium and a "nest." Movement of jaw impaired.	—
Second upper bicuspid removed for access; free and deep excision.	Recurrence <i>in loco</i> ; stiffness of jaw. Extension along palato-maxillary canal and among pterygoids diagnosed; temporary resection or removal of maxilla, to obtain access, suggested.	Recurrence; further operation declined; death.
All affected parts cut away freely.	—	Lost sight of.

RIGHT FLOOR OF MOUTH.

Left Kocher's cut. Submental and submaxillary region cleared, also upper carotid. Several apparently healthy glands beneath sternomastoid removed. Medial division of lip and chin, reflection of left cheek to masseter; jaw sawn behind and to right of epithelioma and removed after division of mylohyoid and mucosa. Growth on right side now found and removed; mucosa on inner side of jaw being elevated with the small ulcers. But it had extended into sockets of bicuspid teeth; these were freely gashed to avoid complete resection of arch.	—	May, 1901. Doing well. No recurrence. Left ramus markedly flexed, but not causing inconvenience. Portion of chin left not much displaced. Gape 1½ in. March, 1903. Letter of enquiry returned marked "Deceased."
---	---	--

FAUCES.

Cut from below ear to cricoid: fat and glands stripped upwards from vessels and well outside them — some enlarged glands beneath digastric. Right cheek split from angle to masseter. Growth excised cleanly with ¾ in. margin — outside red area on tongue and palate — and removed with superior constrictor and tissue outside it. Recovery and healing good.	December, 1898. Recurrence in glands on right side of neck; removed January, 1899. August, 1899. Large inoperable recurrence in glands of left anterior and posterior triangles.	Inoperable recurrence. Died December 23, 1899. P.M. No growth found other than that in left anterior and posterior triangles, involving the great vessels.
Kocher's cut and extension along sternomastoid: complete clearing of submaxillary, subparotid (2 large glands), upper carotid regions, of carotid sheath down to cricoid (3 or 4 small glands) and of posterior triangle, along 11th nerve (3 or 4 small). Right ramus of jaw removed. Growth cut away freely, including the tonsil with both pillars, neighbouring mucosae, and much of both pterygoids; almost whole wound gauze-drained.	—	Death on 10th day: cause? Did well up to 8th, on which night he became delirious and refused food. On 9th temp. 97°, pulse 104, respiration 22. Some discharge bagging in front of submaxillary wound. P.M. Removal complete: viscera normal. Brain oedematous: many arachnoid adhesions.

No.	Sex.	Age.	Duration.	General Condition.	Local Condition.	Glands.
3. 1899, Feb.	M.	56	10 weeks difficulty in swallowing ; sore throat ; slight earache. Thin patient.	Good. Some loss of flesh.	Ulcer of right half of soft palate, uvula, anterior pillar, mucosa over lower jaw behind last molar.	One large right sub- maxillary gland.
4. 1899, May.	M.	52	2 months lump in neck. 6 weeks slight pain in swallowing.	Emaciated.	Mouth normal. Glottis normal. Epiglottis drawn to left ; puri- form fluid seen, and a hard edge felt on its left side.	Hard mass below left angle of jaw, adherent to deep structures, including ala of thyroid cartilage near superior cornu.

the lip was affected, but the left edge of the ulcer was still separated from the scar of the first operation by $\frac{1}{8}$ th inch. The lip-growth appeared to be unconnected with the original cheek-growth. In both these cases the cheek-scar was but little visible, and the gape was surprisingly good.

In one case, No. 5, the epithelioma had been allowed to perforate the skin, and to form a mass in the cheek, of the size of half a small orange, fixed above to bone. As it seemed possible to remove all disease and to close the gap later by a plastic operation, excision was done, the patient dying in 65 days of septic bronchitis. During 36 hours previous to operation this patient's temperature varied between 98.8 and 99.4 ; but nothing amiss was found in his lungs then or as late as the 46th day.

In two women (Nos. 1 and 6) the cheek and lower alveolar process were involved. No. 1 was much the more serious of the two as regards both local and glandular disease. The primary growth was removed with scissors through the gagged-open mouth—a most unsatisfactory method—and the gland-operation was much too limited. She has not been traced. In No. 6 a fairly wide gland-operation was performed, and

Operation.	Recurrences.	Result.
Kocher's cut. Submaxillary and upper carotid regions cleared. Cheek split to masseter: most of palate, anterior pillar, mucosa on jaw behind last molar (drawn), and bit of tongue hard by were removed. [It was noted that mouth could not be fully opened under C.H.C. _l s (from unrecognised infiltration of muscles?); lighting and access were unsatisfactory.]	In March, 1899 (1 month), a small recurrence over coronoid process was removed and bone deep to it was nibbled away. In May, 1899 (3 months), a similar recurrence, with inability to separate jaws: cheek split again, ulcer removed, bone deep to it chiselled and cut away with forceps.	Recurrence in fauces and neck. Death on March 9, 1900.
Long cut down sternomastoid and another forwards to midline below hyoid: triangular flaps reflected. These were removed: glands over parotid; large gland-mass and superjacent parotid, large adherent piece of sternomastoid, and long piece of internal jugular. Also glands along 11th nerve. Pharynx opened by transverse cut through middle constrictor. Notes state only that part of left pharyngeal wall, great corns of hyoid, and upper part of left ala of thyroid cartilage with thyrohyoid membrane were removed. Pharynx closed: neck-wound closed above, gauze-drained below. Little shock: all seemed well on 5th.	—	Death on 5th from asphyxia from inspired blood. P.M. Internal carotid had burst at root: coats very thin and transparent round the hole. No trace of growth except perhaps at a spot outside aryteno-epiglottid fold. Much inspired blood in lungs.

access was obtained to the primary growth by splitting the cheek. Within three months she was thought to have a slight recurrence, but this seems doubtful; there is no microscopic note, and the operation performed would probably have been unsuccessful. She remains (three years) in excellent health, and the deformity of the scar is slight. The gape is good, the vertical involvement of the cheek having been limited.

In No. 8, a man, the local condition was probably very similar to that in the first of the two preceding cases (No. 1), whilst infection of glands was apparently less serious, and was dealt with by a Kocher's operation. Removal of the primary growth was effected through the split cheek, a rugine being used to detach it from the alveolar and coronoid processes to which its base adhered. After six months it was found that the teeth could only just be separated—a result very different from that noted in the preceding cases, in which the epithelioma lay entirely in front of the last molar. A history of persistent "neuralgia" roused grave suspicions of recurrence, and with a dental mirror an ulcer could be obscurely seen behind a short vertical cicatricial band which held the jaws together. A free

removal of the recurrence, coupled, this time, with a chiselling off of the surfaces of the coronoid alveolar processes, resulted in further failure and ultimate death.

The next posterior cheek-case (No. 11) which came under treatment was rendered graver than the last by swelling of the cheek and extension to the upper gum, the soft palate, and the mucosa over the coronoid process. After the usual Kocher's gland-operation, access to the primary growth was obtained by splitting the lip and chin in the midline, and turning back the cheek and submaxillary flaps. To anticipate cicatricial stenosis and increase access, a wedge of jaw was removed from the angle (primary Esmarch's operation), its apex being formed by the coronoid process where it was covered by the epithelioma. The ulcer was then clipped out with a good margin, the rugine being used to separate its base from the maxilla and hamular process. Some of the temporal tendon was involved, and was removed. Great swelling of the cheek resulted from this operation and persisted for many weeks, slowly subsiding. After seven months all seemed satisfactory ; but three months later a rapidly-spreading and inoperable local recurrence was present.

The last case of this group (No. 10) probably began about the tuberosity of the left upper jaw. When seen, after only three weeks' suffering, he was so thin and ill-looking as to raise the suspicion of advanced malignant disease. His friends said he always looked "like that." Only an ulcer of moderate size, spreading on to the cheek and soft palate from the tuberosity of the maxilla as a centre, was found. Thinking it probable that the antrum was invaded and that limitation of movement of the mandible ($\frac{1}{4}$ -inch gape) was due to infiltration of muscles behind the maxilla, access to the growth was obtained in this case by reflection of the cheek from the maxilla ; no deep extension of the disease was found, and it was thought at the time that a better view would have been obtained, and greater facility for working behind the maxilla afforded, by reflection of the cheek from the lower rather than from the upper jaw. As the wound healed, the jaw became fixed ; but until six months had passed without obvious recurrence, it was thought undesirable to

yield to the man's earnest entreaty for an Esmarch's operation. After this, he improved markedly for a short time ; then the jaw again became fixed, and he died at home—presumably of recurrence.

We turn back now to a case (No. 3), which occurred in 1899, of such distribution and extent as to require removal of the angle and ramus of the mandible. There can be no question as to the freedom of access which this affords ; but we cannot base any conclusion upon the satisfactory result in this one case, especially as the history seems to point to a more chronic form of cancer than was present in Nos. 7 and 10. A "wart" had appeared on the inner surface of the cheek two years earlier, and had grown slowly for 18 months, more rapidly for the last 6 months, the skin at the angle of the jaw becoming infiltrated during the last 6 weeks. When seen, an epithelioma extended from one inch behind the angle of the mouth nearly to the anterior faucial pillar, and from the edge of the hard palate posteriorly down to the lower alveolus in the molar region ; thence it passed downwards and backwards adhering more and more closely to the inner surface of the mandible, and infiltrated the skin just beyond its angle. The submaxillary glands were markedly affected. A submaxillary incision was planned to circumscribe the involved skin and to allow removal of the submaxillary and upper carotid glands. Then the lower lip and chin were divided in the midline and the cheek was reflected, so as to leave the growth behind. The jaw was sawn in front of the point at which the growth came into contact with it, and the ramus was removed by disarticulation with the whole growth adherent to it. In March, 1903, ($3\frac{1}{2}$ years) this patient was in excellent health and free from obvious recurrence. There was no median notch in the lower lip ; the chin deviated but little ; the depression over the left angle was concealed by whisker, and the mouth opened fully. He said that he had been at home three months before he discovered that he had lost a piece of his jaw ! This absence of marked deformity seems to be exceptional after removal of the ramus, and our experience is insufficient to enable us to explain it in this instance.

In January, 1904 (4 years, 1 month), this patient reported himself as being quite well.

Perhaps this is the best place to refer to the case of a woman (No. 4) with recurrent disease of which the exact primary seat is unknown to us. We think it may have been the cheek low down and far back. She had been operated upon by another surgeon through a curved incision round the angle of the jaw, no bone or glands (apparently) being removed. She had, when seen 3 months later, a sinus in the centre of the scar. An ulcer occupied the left lower alveolus from the bicuspid region to well up on the coronoid process; it just involved the floor of the mouth, but the floor of the sulcus outside escaped. Beneath the normal mucosa here, however, was an almond-sized mass attached to the jaw. A considerable submaxillary mass adhered to the jaw. This patient was most anxious to avoid deformity, and was with difficulty persuaded to allow any operation. It was clearly necessary to excise the sinus, and this, together with the presence of a very obvious scar, obliged us to use the line of the old incision, and to prolong it forwards along the edges of the jaw to the midline—in the position of the old-fashioned incision for excision of half the mandible. It was exceedingly awkward for a submaxillary gland operation, and the upper carotid region was not cleared. It was hoped that the lower edge of the mandible might be saved: so the adherent submaxillary mass was separated from the bone with a rugine. It brought away the periosteum with it and burst, flooding the wound with its contents; 5-per-cent. carbolic, the strongest antiseptic at hand, was used to wipe out the wound. It was now plain that the whole depth of the mandible must be sacrificed. To this end the cheek-skin was raised from the submucous mass, and the bone sawn in front of the disease, an endeavour being made to avoid splitting the lip and chin; but without doing this it was impossible to deal satisfactorily with the floor of the mouth. So ultimately the cheek was turned back, the jaw was again divided through the angle, and the anterior half of the coronoid process with its temporal fibres was split off with bone-forceps and removed. As usual, the patient suffered for placing restrictions upon the freedom of the surgeon. Every step which would have been

taken had there been no request to consider was enforced by the conditions found, and was taken—too late to be of full advantage to the patient—after a good deal of work had been done in the dark. Recurrence was early and at a spot difficult to account for, viz., in the lower lip near the angle, where an indurated sinus, half an inch long, formed and whence extension in all directions occurred. Possibly the sinus was longer than a probe seemed to indicate, and really started from the wounded area.

It is difficult to group these cases ; but we have one more (No. 9) which seems to have its closest affinities with cancers starting far back in the cheek. After two months' treatment with lotions for a sore and pain about the right lower wisdom-tooth, the tooth was removed ; and as the pain continued and the socket did not heal, further treatment was sought. The right cheek was greatly swollen, and on its inner surface, far back, was a deep ulcer, which seemed to burrow beneath the masseter. It spread across the jaw into the socket of the last molar, across floor of mouth, and just on to the side of tongue, upwards and backwards for an inch along the coronoid process, and thence inwards on to the tuberosity of the maxilla and slightly on to the palate. No glands were felt, but the patient was fat. Examination under anaesthesia during the operation revealed a mass of disease in the base of the tongue, which, had it been discovered earlier, would probably have turned the balance against any operation. This being the case, it will be sufficient to refer to the table for details, and to note here only that inoperable recurrence was the result, followed by death in 17 months.

We have now dealt with 10 primary cases of epithelioma originating, or seeming to originate, on the inner surface of the cheek. The two last are open to considerable doubt in this respect. Seven occurred in men and three in women. The average age was 52, the extremes being 38 (F.) and 63. All were operated upon : one died of septic broncho-pneumonia ; four remain free from recurrence at 4 years and 8 months, 4 years and 1 month, 3 years and 1 month, and 3 years and 5 months. Of these the first has not been heard of since July, 1903, to which time the above period is reckoned, and the

last returned 3 years after the first operation with an epithelioma of the lower lip, apparently quite unconnected with his original cheek-growth. He is now (January, 1904) free from further recurrence. In one, the result is unknown, but recurrence seems highly probable; in four there was inoperable recurrence. One of these was almost, if not quite, unsuitable for operation. On the other hand only one of the four cases remaining sound was an extensive posterior case.

In two the anterior part of the cheek was alone affected, and it would seem from the result that in such the removal of the submaxillary and upper carotid glands (from beneath the digastric down to the bifurcation), together with the free removal of the growth through a wound in the skin of the cheek, will be satisfactory both as regards life and function.

In the remaining eight cases the posterior part of the cheek, opposite to and behind the molar teeth, was the seat of disease. In all some parts other than the cheek were involved. A free gland-operation is of course essential, and it would seem that the removal of the submaxillary and upper carotid glands down to the level of the bifurcation of the carotid is sufficient, when no glands or only submaxillary glands can be felt enlarged. With regard to the removal of the primary growth in this region, attempts to do so through the mouth (one case) may be condemned as most unsatisfactory. Splitting the cheek back to the masseter improves access, but is not wholly satisfactory even in a simple case, such as No. 6; and where the growth is believed to infiltrate the structures beneath its base (*e.g.*, coronoid, masseter, temporal), we think it is decidedly better to divide the lip and chin in the midline and to turn the cheek freely back. It is true that this sometimes, and in spite of perfect apposition and alignment of parts, leaves a central notch in the lip and an obvious skin-scar (No. 4); but a long cut through the cheek may also be very deforming. It will probably be wise, therefore, to reflect the cheek and thus obtain good access to even apparently slight epitheliomata situated in the region of the coronoid process. This operation allows satisfactory removal of any bone with which the growth may come into close relation, and it is well to excise the bone and growth in one piece. When extension of the growth to

the floor of the mouth, tongue, or fauces requires it, it is easy to divide the jaw at any point which will afford convenient access by dragging the gap open ; or to remove a part or the whole of the ramus, either on account of involvement or to obtain a clearer view. Whenever it is fairly certain that cicatricial closure of the jaws will result from the operation and the jaw has to be divided, it seems to us an advantage to remove at once such a wedge as will ensure permanent mobility of the jaw : for, thus, access is certainly improved and the patient does not go through a period of inability to masticate with resulting discontent and loss of flesh and strength. If, however, it is not necessary to divide the jaw for access, we are doubtful whether an Esmarch's operation should be done at the time of the primary operation, with the object of warding off cicatricial closure, as it seems to us that the probability of septic necrosis of the cut surfaces of the jaw is greater at this time than later, when the mouth has healed. On the other hand, we are of opinion that, when necessary, excision of a wedge of jaw in front of the scar should not be too long withheld--until, for example, the surgeon is satisfied that early recurrence will not take place. In one case (No. 10) we adopted this course to the great dissatisfaction and, as we believe, detriment of the patient. The operation, done with a chain or Gigli's saw, is a slight one, and may well be performed without regard to recurrence.

In addition to the ten primary cases, there was one in whom the growth was recurrent when first seen. In her case treatment was somewhat hampered by restrictions, and the result was inoperable recurrence.

HARD PALATE.

We must next refer shortly to single cases, fully stated in the table. No. 12 began as a small, constantly-painful ulcer on the hard palate in the immediate neighbourhood of the posterior palatine canal. Its appearance was very unlike that of an epithelioma, which the microscope again and again showed it to be. There was never, whilst under our observation, much to be seen in the mouth ; but after fairly wide removals of what was visible, the recurrences appeared at a spot which seemed to indicate that the new growth had

penetrated deeply along the posterior palatine canal. The probability of extension in this direction was recognised, and two attempts were made to get above it. More could not have been done, working through the gagged-open mouth ; so the case suggests that in November, if not in October, permission to obtain freer access to the region behind the maxilla should have been sought. This patient wandered about seeing many first-rate surgeons : some declined to believe in the epithelioma, and he took their advice. In March, 1898, he wrote that the "place" felt healed, but his jaw was fixed. He wasted steadily and died some months later.

SOFT PALATE.

We have had one case (No. 13) of epithelioma of the soft palate, which was freely excised. The man cannot be traced.

GUM AND FLOOR OF MOUTH.

The chief point of interest about No. 14 is that two distinct epitheliomata were present in the mouth. The man came complaining of a sore upon the left side of his mouth, which was recognised as a fairly extensive epithelioma of the left lower alveolar margin, and an operation for its removal was undertaken. Late in the progress of this, an epithelioma of the right floor of the mouth was found, extending into the sockets of the lower bicuspids. This extension was not very thoroughly treated. Enquiry about this patient has enabled us to discover only that, two years after the operation, he was dead.

THE FAUCES.

In four cases an epithelioma affected the fauces, or the region included between the soft palate and the arytaeno-epiglottic fold, above and below, and between the anterior and posterior pillars of the fauces from before backwards. The extent of the primary and of the glandular growths varied as shown in the table. No. 1 was apparently slight in both respects, though he gave a longer history (six months) of trouble than any of the others. In Nos. 2 and 3, especially the former, both primary and glandular growths were serious ; and

in No. 4 a small primary growth outside the arytaeno-epiglottic fold had given rise to a very serious gland-mass which involved the sternomastoid and vessels. In all cases a free gland-operation was done, special attention being paid to the glands deep to the parotid and digastric, to those along the jugular vein, at least as low as the cricoid, and to those along the spinal accessory nerve. The primary growth was approached twice (Nos. 1 and 3) through the split cheek, and in No. 3 it was specially noted that both lighting and access were unsatisfactory. In No. 2 good access was obtained by removal of the ramus of the jaw ; and in No. 4 the low situation of the growth required the removal from the neck-wound of part of the side-wall of the pharynx, together with the great cornu of the hyoid and the upper part of the left ala of the thyroid cartilage.

The results have been extremely discouraging. Two patients (Nos. 2 and 4) died directly from the operation. In No. 2 even the post-mortem examination did not make clear the cause of death ; presumably it was some form of septicæmia. No. 4 died on the fifth day from rupture of the internal carotid at its root, where it was somewhat dilated, and its coats around the perforation were very thin. It is noted that "the common, external, and internal carotids were closely cleaned in part ;" probably the cleaning was too close at the point of rupture, though some inclined to the view that sponging of the wound with strong chloride-of-zinc solution was responsible. Early and inoperable recurrence followed in No. 3. In No. 1 there is some reason to hope that the primary growth was eradicated, as it did not recur in the $1\frac{1}{4}$ years which the man lived after its removal. Possibly the infection of glands on the same side as the primary growth had been successfully dealt with, as there was no further recurrence in 11 months. Infection of the left glands was not anticipated : the recurrence was inoperable when first seen.

With regard to the question of access to the primary growth, if this be situate upon the tonsil or palatine arches, our small experience would lead us entirely to distrust removal through the split cheek, and to prefer division of the jaw in front of the ramus followed by separation of the fragments ; and, should there still be insufficient room for free work under guidance of sight, more or less of the ramus should be

excised. When thus opened up, the region is one in which it is possible to remove a good deal of tissue without trenching too closely on the more or less essential vessels and nerves. This will be evident upon reference to Fig. 1, drawn from a subject in which the right half of the mandible had been removed, and to Fig. 2, a horizontal section at the level of the teeth, after a drawing in Cunningham's *Text-book of Anatomy*.

When the primary growth lies low in the region under consideration, it can be readily dealt with through the side-wall of the pharynx below the jaw.

That the operation upon glands must be free is obvious. In the case of tonsillar and palatine cancers the upper carotid

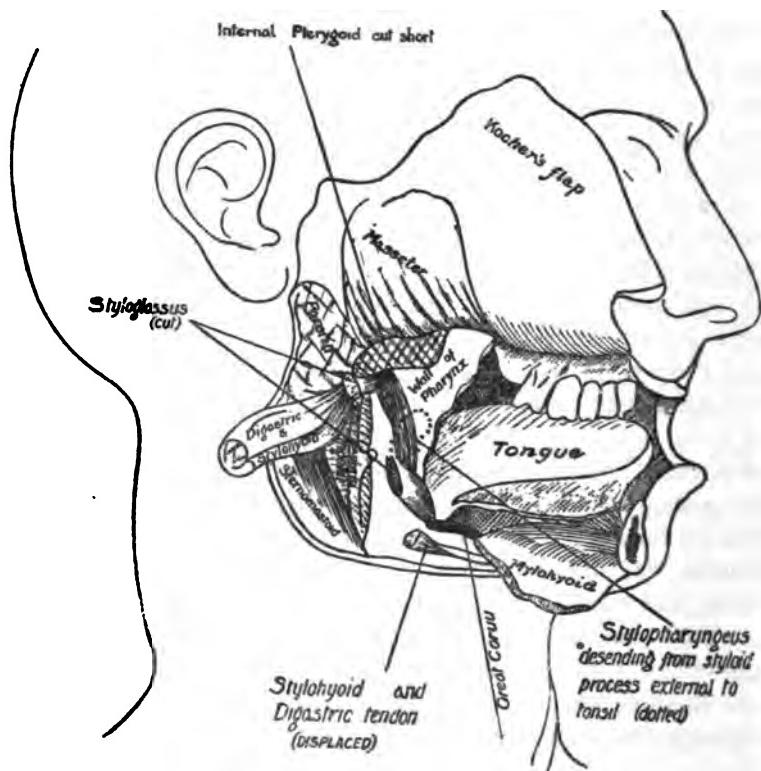


Fig. 1.

glands, deep to the digastric, are probably the first to be infected, and then those lower along the great vessels and those passing back along the spinal accessory into the posterior

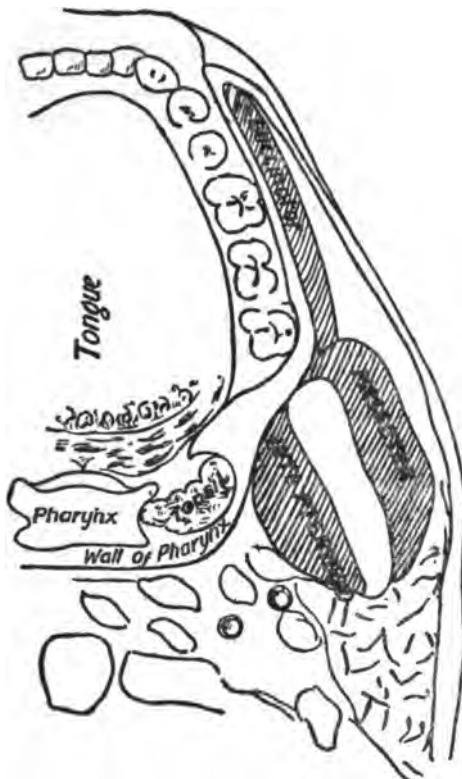


Fig. 2.

triangle. Case No. 3, however, shows that the submaxillary group may not be neglected.



TWO LECTURES ON ECZEMA.¹

By ARTHUR WHITFIELD, M.D. (LOND.), M.R.C.P.,

*Assistant Physician in charge of the Skin Department, King's College Hospital;
Physician to the Skin Department, Great Northern Central Hospital.*

LECTURE II.

[With Plates X.-XVI.]

GENTLEMEN,

IN dealing with the clinical description of eczema, we find that the appearances of the disease are so variable that, unless we introduce some kind of order into the different conditions, we may go on almost for ever describing fresh forms. Although there is a tendency to separate off the old acute eczema as "acute traumatic dermatitis," a tendency to which I have already referred as in my opinion a mistake, I shall take acute eczema as the type of the disease and then allude to the variations from this type in their places.

The earliest stage is that known as erythematous eczema, and consists of a patchy redness of light colour and indefinite outline. When one examines the part carefully, one finds that there is already a slight swelling and disturbance of the surface-epithelium, often accompanied by a semi-translucent appearance due to oedema of the papillary body and the epidermis. It is seen best where the skin is delicate, and in people with delicate skins: thus the face, flexures of the joints, and scrotum are favourite sites for it to be well marked. This stage persists only for a short time, the redness either dying away or being followed by the next, the papular stage. In this we find the surface studded with small soft papules of the size of a pin's head—lesions which do not to any appreciable extent enlarge. The papules are hardly solid, in reality being due to circumscribed collections of fluid deep in the epidermis, but not sufficiently marked to show as vesicles. After a short time, as the pressure rises, the fluid which occupies and dilates the inter-epithelial spaces, tears a regular cavity for itself, and

¹ Delivered at the Medical Graduates' College and Polyclinic, November 23 and 24, 1903.

PLATE X.



Fig. 4. *Acute eczema : vesicular and crusted stage. Patient alcoholic, and working in a very dusty warehouse.*

PLATE XI.



Fig. 5. Crusted and septic eczema of legs : varix.

coming more and more towards the surface, shows itself as a vesicle, forming the next stage—vesicular eczema (Fig. 4). In parts where the epidermis is thin, as on the face and scrotum, these vesicles very soon rupture, allowing the exudation of clear straw-coloured serum ; while on parts such as the hands and feet, where the epidermis is thick and the horny layer resistant, they may persist as vesicles for some days, and before they burst on the surface may run together to form large blebs. The vesicles may be either scattered about over the affected part, or they may form a continuous sheet, or again they may be collected into little irregular groups. Except on the palms and soles they almost invariably arise from a red and oedematous base ; but occasionally they may be seen, when arising in a discrete and scattered manner, to occur with only very slight hyperæmia. On the bursting of the vesicles, we arrive at the sweeping stage, or *eczema madidans*, which presents itself as a bright or, more commonly, a dark-red, raw-looking surface covered with points of exuding serum and small red puncta, representing the original vesicles and the dilated papillary vessels from which they arose. If the discharge remains profuse, one finds only the slightest scabbing ; but directly it begins to cease, yellowish scabs begin to accumulate over the inflamed area, and usually also an attempt is made at the formation of a new horny layer to replace that which is already lost (Fig. 5). General oedema of the more superficial parts of the skin is present, giving the area a swollen and cushion-like feeling. If, either as the result of treatment or as the natural termination of the disease, the discharge entirely ceases, the new horny layer rapidly covers in the excoriated surface, forming a thin, transparent, and somewhat inelastic covering over a surface which is still swollen and oedematous. This new horny layer is always lost several times before the part returns completely to the normal, so that the redness and scaling go on for some time after the active inflammation is over. This description may be said to apply to the classical attack of acute eczema, as we usually see it on the face, hands, and scrotum, but it may also occur in almost any position.

More generally, perhaps, acute eczema is a scattered disease, producing patches of the eruption symmetrically distributed

over the trunk and extremities. In such a case the patches do not all go through the evolution just described, but many of them remain in the papular stage, dying down again without the production of vesicles visible to the naked eye. In many cases, also, the eczema may be chronic from the first, and then usually begins as small, slightly hyperæmic papules, generally situated at the mouths of the follicles. These run together and produce a patch of brownish redness, over which the epidermis is continually scaling. Very often no moisture is found at all on close examination, but usually smart rubbing will detach the scales in very fine pieces, and a small amount of serous oozing will follow. In time the patch becomes progressively thicker, until it reaches a very definite stage of induration. When picked up between the fingers at this stage, it feels harsh, stiff, and thick, but does not give an idea of great depth. There is no doubt that the thickening is largely superficial in site, and it is not at all uncommon to find the usual markings of the skin immensely exaggerated, forming the condition known as "lichenification." On the palms and soles the chronic form of eczema tends to produce great hyperkeratosis, and owing to the faulty nature of the new horny layer deep cracks, extending right down to the true skin, are apt to occur. To this condition is sometimes given the name *eczema rimosum*. On the legs also eczema may be accompanied by great hypertrophy, even reaching a papillomatous condition. This is in my opinion distinctly rare, however, and seems to be almost invariably associated with some form of grave lymph-stagnation, such as occurs in certain cases of elephantiasis nostras. This being the case, I would caution you to regard with extreme suspicion all cases of *eczema verrucosum* occurring on an otherwise-healthy leg. Some of these cases are in reality hypertrophic lichen planus, others are mycosis fungoides, &c.

As regards the extremely œdematosus eczema associated with varix of the leg, we are, I think, apt to conclude too readily that all the œdema is due to the varix. I do not wish to say that the varix is not the cause of at least part of the œdema, because I am quite sure that it is; but I have been struck several times with the diminution which has taken place in the œdema when the leg has been carefully dressed, without any supporting bandage or rest in the horizontal position. If we

PLATE XII.



Fig. 6. *Discrete follicular eczema of the back. (Seborrhöic eczema of lichenoid type.)*

PLATE XIII.



Fig. 7. Seborrhœic eczema of psoriiform type. (Removal of scales showed a discharging base.)

consider for a moment, I think we shall see at once that this must be so, and that it would be extraordinary to have a severe inflammation going on in a part which is already embarrassed as regards its return-circulation without in any way increasing that embarrassment.

Eczema may also affect the nails, and this it may do in one of two ways. It may spread from the dorsum of the finger beneath the posterior nail-fold, and thus attack the matrix ; or it may spread on to the nail-bed from the pulp and tip of the finger. In the former case the nail-plate itself is deformed, being usually somewhat misshapen and over-curved, and showing on its surface longitudinal ribs and small pits, so that it has been likened to the peel of an orange ; while, in the latter, the nail itself is not damaged, but is pushed up from the bed by an accumulation of horny material beneath it.

Before describing the pathological anatomy of eczema, it is necessary to say a few words upon the subject of the so-called seborrhöic eczema. Under this heading are grouped a number of morbid conditions of unknown origin, the *aetiology* of which is generally believed to be parasitic, but in which the pathogenic organism is unknown. Several types are known, and the modern tendency is perhaps to take them out of the order "eczema," and to form of them a distinct class known as the "seborrhœides." I am not convinced of the correctness of this view, and I shall deal with them here, since, even if they are not eczematous in their nature, they are undoubtedly often associated with eczema. The simplest type is perhaps the small, follicular, spongy papule which is seen scattered over the chest and especially the back (Fig. 6). This comes out usually in a great crop and is very itchy, but does not give rise to any marked vesication. In one type these papules persist as such until they disappear, tending to remain discrete, but occasionally forming groups or sheets of variable size. The papules are bright-red in colour, acuminate in shape, and elastic to the touch. They tend to occur in the form of a triangle on the back and chest, with the apex of the triangle downwards, but they not infrequently come out also in a belt around the loins. In another type these follicular papules flatten down, while new papules form around the original ones, so that a ring is formed ; and this is the eruption known as lichen

circumscriptus, circinaria, seborrhœa corporis, or flannel-rash. The centre of the ring thus formed shows as a yellowish, greasy, and slightly pigmented patch, while the edge exhibits the characteristic follicular papules, usually scratched and showing a minute serous scab suggestive of an abortive vesicle. On the scalp of such patients one generally finds a greasy desquamation, with more or less inflammation present. In still another type the eruption produces heavy scales on the body, but these are much more mixed up with exudation than is the case, for instance, in psoriasis : often there is an abortive attempt at vesiculation at the edge of the discoid patch, and a careful search round it will lead to the finding of the groups of follicular papules before described (Fig. 7). These cases simulate psoriasis in some instances very completely, but a careful study of their mode of formation will usually suffice to establish the differential diagnosis. They are often found associated with curious dry, pityriasic patches on the face in children, these facial patches showing no special follicular distribution. Though themselves differing slightly from the condition which we call eczema, they are most frequently the starting-point of a typical eczematous attack, and it is extremely difficult to gain a clear conception of their relation to this disease. If, however, we believe them to be parasitic, we may imagine that they start by breaking the horny layer and diminishing the resistance of the skin to other irritants, and that they then, on account of their extreme irritability, cause a trauma which determines the truly eczematous attack.

The parasite causing them must be a very common one, since they appear so often in hot weather in people who wear irritating underclothing ; also the parasitic origin must be limited in importance, since we know that they are not markedly, if at all, contagious. Many people have investigated the organisms present in the various forms, and there is now a certain consensus of opinion, among those who have carried out research upon the subject, that the organism causing the eruption is a staphylococcus, which does not liquefy gelatine, but produces a smell of butyric acid in culture. In this case the actual lesions may be due to the decomposition of secretions rather than to actual infection, or the organism may increase in virulence under suitable conditions of the skin.

PLATE XIV.

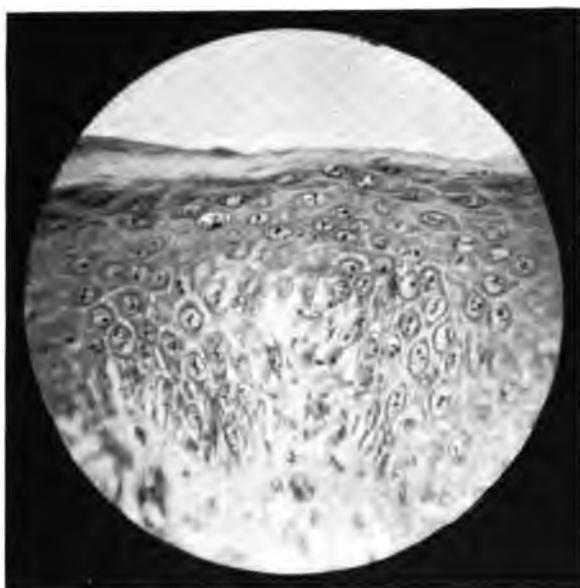


Fig. 8. *Primitive vesicle of eczema ; earliest stage of suprapapillary œdema.*

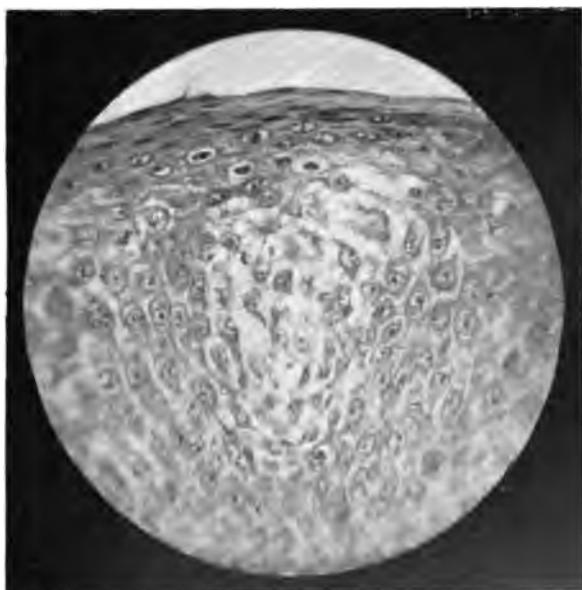


Fig. 9. *Primitive vesicle of eczema in the centre of the epidermis.*

PLATE XV.

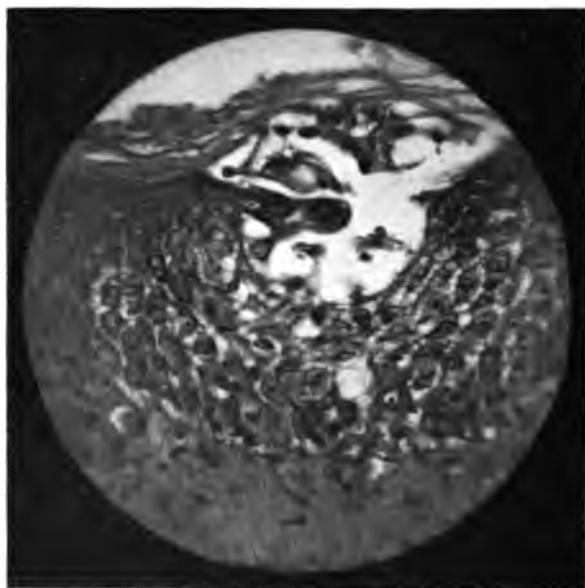


Fig. 10. *Primitive vesicle of eczema. The vesicle has risen until it lies beneath the horny layer. It is still free from pyogenic infection.*

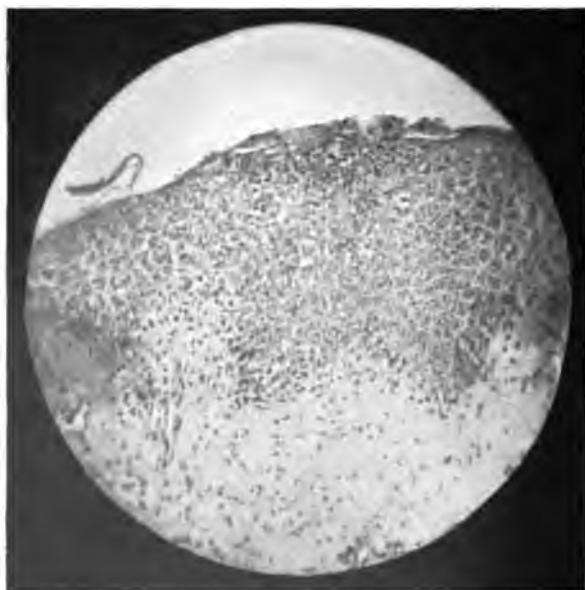


Fig. 11. *Crusted and infected stage of eczema after rupture of the primitive vesicle. Crust infiltrated with leucocytes.*

I shall now say a few words on the pathological anatomy of eczema. We have already discussed the possibility of eczema being due to a specific parasite, and I have given my opinion against this. If we examine the papulo-vesicular stage of eczema, we find that the earliest papule or vesicle is caused by the accumulation of fluid between the prickle-cells of the deepest layer of the epidermis, by exudation from the immensely-dilated capillaries below (Fig. 8). It would almost appear as if an individual loop of blood-vessel were affected, and this gives an idea as to why the papule or vesicle of eczema does not appreciably enlarge. Cultivation-experiments to determine whether this earliest lesion is infected or not, seem to me to be almost worthless, since it is impossible with our present resources to combat the surface-sepsis without endangering the growth of organisms in this deep vesicle. Microscopically, however, we find that this vesicle is quite free from any emigrated cells, and this is strong evidence that it is not due to ordinary pyogenic cocci at any rate; also no organisms are demonstrable in the vesicle by appropriate staining. As the pressure rises in this collection of fluid, the connecting fibrillæ are ruptured, the cells are pushed apart, and a definite vesicle is formed, which rises slowly to the surface and then usually ruptures (Figs. 9 and 10). From the moment that this rupture has taken place, the lesion becomes infected with pyogenic organisms, and henceforth the vesicle or crust is associated with the emigration of numerous leucocytes (Fig. 11). The lesions of the true skin at this early stage are dilatation of the blood-vessels and oedema.

As the disease passes into the scaly state, we recognise the scale histologically as a mass of so-called "parakeratotic" horny cells. This parakeratosis or imperfect cornification differs from the normal in the following particulars:—We know, chiefly from the researches of Ranvier, that the epidermic cell, as it makes its way up to the surface, undergoes various changes, which begin by the loss of staining-power of its nucleus and the appearance of basiphile granules in its protoplasm, and terminate with the production of a keratin-envelope full of fat. Now this imperfect cornification consists of the development of the keratin-envelope to some extent, but the nucleus remains stainable, and the interior of the envelope

appears to be moist protoplasm instead of fat. On the surface the moisture evaporates, and the cell shrinks and becomes brittle, so that it is almost useless as a protective covering. When the eczema persists, there is added to these symptoms that of proliferation, and this affects two places markedly. In the first place, the whole of the living part of the epidermis becomes much thickened—a fact which we are enabled by touch and sight to appreciate clinically—and the epithelial ridges and the papillæ become hypertrophied, so that the line of junction of the epidermis and true skin becomes much more sinuous than normal (Fig. 12). Secondly, a very marked proliferation of the endothelial cells of the walls of the blood-vessels and perivascular lymph-spaces takes place, which, I should think, must be extremely difficult to remove by treatment (Fig. 13), and which probably persists in this, as we know it does in other diseases, long after the apparent return of the skin to the normal, rendering it prone to relapse.

I have dwelt in some detail on the pathological anatomy of these various stages, because I believe they have a very great importance in helping us to select our treatment. There is no specific local treatment for eczema any more than there is any specific internal treatment; and I think therefore that to correlate in this way the macroscopic changes with what one has learnt to be the microscopic conditions, enables us to detect the process which is the predominating factor at any stage, and so far as possible to direct one's efforts towards combating this.

We will now briefly pass on to the treatment of eczema, and I shall as far as possible attempt to give you an outline of the principles involved, though of course it is out of the question to enter into every detail. I think that, when a case of eczema is presented to you, the first and all-important point about which to make up your mind is the relative importance in the particular individual of the internal and the external factor respectively. To do this, a very thorough overhauling of your patient may be necessary, and at all events in many cases a carefully-elicted history is of the greatest value. If the internal factor is the more important, is the condition more probably due to nervous irritability and overstrain, or is it more probably toxic? In the former case, one may often do good

PLATE XVI.



Fig. 12. *Chronic eczema. Exaggeration of the normal wavy line of junction between epidermis and corium. Parakeratosis of horny layer. Vascular dilatation.*



Fig. 13. *Chronic eczema. Proliferation of cells round small blood-vessels in the corium.*

by the exhibition of bromides, belladonna, and antipyrin, though the last-named should be given only with the definite purpose of subduing irritation and inducing sleep. If one has a perfectly free hand, one may think of change of air, but this is only too often a counsel of perfection. In those cases in which change of air is obtainable I think a high dry atmosphere, such as is found among the Swiss mountains, is of the greatest service; but one should remember that it is not advisable to send patients to high bracing places if they are liable to be exposed to strong cold winds or sea air, or if they have to use very hard chalky water. In any case where the toxæmia seems to be the chief factor, a course of salines with a very simple diet, including very little meat, is often of service, and there is no doubt that some cases are benefited by colchicum or salicylates, if they are really gouty. In those cases where the circulation is extraordinarily excitable and the eczema seems to occur on almost urticarial basis, full doses of quinine will often cause a great improvement. In patients with an indolent type of subacute eczema, combined with obvious debility, iron is often indicated, and in some cases the syrup of the iodide of iron is a good preparation. Dyspepsia is, as has already been mentioned, a pretty common cause from the internal side, and this must be appropriately treated.

The elucidation of the local factor may be a matter of extreme difficulty, as instanced by the case of phenyl-hydrazin poisoning which I have already quoted; but given its detection, it should not be a very difficult matter to avoid it. Remember always that acute relapsing eczema of the face and hands should suggest to your mind the possibility of its being due to the presence or handling of noxious plants, such as *Primula obconica*.

Now, as regards the actual local applications, one must be guided almost entirely by the conditions which are present in the skin. In the acute erythematous and papulo-vesicular stage, one will usually find that lotions and powders are the most suitable. Such applications should be mildly antiseptic, though it is bad to apply any antiseptic which is likely to cause irritation. As an instance of a suitable powder we may take equal parts of boric acid and starch; or if the inflammation affect a part where there is much secretion, such as the feet or axillæ, we

may use the powdered oleate of zinc. As lotions, the two most generally used are lead- or calamine-lotion, the latter acting on drying as a powder. These two are used indifferently by some, but it is perhaps useful to remember that, although in most cases where it is desirable to apply a lotion it is best to keep it continuously applied and always wet, yet calamine-lotion has not lost all its action when dry, owing to the powdered calamine remaining behind, whereas lead-lotion appears to be quite useless the moment it has evaporated. If itching be severe and not controlled by the use of these lotions alone, a small amount of carbolic acid (not more than 1 per cent.) may be added to either. Another favourite lotion is one made by dissolving 3 per cent. of ichthylol in water and applying continually. Ichthylol is a drug of extraordinary value in all acutely hyperæmic conditions, and very seldom acts as an irritant if kept below 3 per cent. strength. In many cases the prompt use of these measures will cut short an attack, but in others the disease will go on to the weeping stage in some parts at least. In this stage, if one has full control over the patient, it is better probably to keep him in bed and to continue with the same measures that I have already indicated ; but powders are now no longer so useful as lotions. These latter fulfil the important condition of securing free drainage, and by their mildly-antiseptic properties they inhibit the growth of pyogenic organisms in the exuded fluid. As soon as the discharge shows signs of stopping, one may begin to think of making some change in the application. In older times ointments were the usual substitutes ; then these were largely replaced by pastes, that is, bases compounded of powder and grease, thus having the advantage of being to some extent absorbent and more adhesive. Later, the simple paste was modified by the addition of water, so that a cooling effect was obtained as well. As instances of such bases I may quote the "Lassar's paste" base—powdered zinc oxide and starch, of each one part; soft paraffin, two parts—and the zinc-cream which is made up in the following manner :—One ounce of olive- or sweet-almond oil is taken and in it is dissolved about a drachm and a half of anhydrous wool-fat ; with this is then incorporated an ounce of powdered zinc oxide, and after thorough mixture of these components, an ounce of lime-water

is gently stirred in. The resulting mixture should be of a similar consistency to that of Devonshire cream, and should spread out on the skin easily to a thin coating which dries on to a slightly greasy varnish. It may be easily modified by the addition of various drugs such as camphor, resorcin, calomel, or ichthyol ; but salicylic acid must not be added, as it causes an immediate separation of the water.

Under one of these applications most cases of acute weeping eczema will yield, but there are forms in which the weeping is very profuse, generally of some standing and associated with a very marked oedema of the skin, in which all the simple soothing remedies seem to be powerless. For this type the following method of treatment often gives brilliant results :—The part is painted once every twenty-four hours with a solution of silver nitrate in distilled water, of a strength varying from $\frac{1}{2}$ to 10 per cent., while for the rest of the day it is wrapped in lint saturated with calamine-lotion. After a few days of such treatment the discharge dries up, and a harder-looking epithelium seems to be forming under the blackened scales. As soon as the discharge is completely stopped, the treatment should be altered to one of the pastes above described. In some cases the strong solution of silver nitrate seems to irritate the skin to a certain extent, and the patients will often refuse to bear the slight pain that is associated with its application. Under such circumstances I have tried the application of a 10-per-cent. solution of nucleide of silver (that sold under the name of nargol being the preparation with which I have worked), and it has appeared to act very beneficially ; but I think as a routine application it is less effectual than the ordinary nitrate of silver.

We will suppose that under one of these methods of treatment one has succeeded in causing the cessation of all discharge, but that the surface is still covered with a very thin and inefficient horny layer, with a good deal of oedema of the epidermis, making itself evident as a sponginess of the surface with a bluish-purple colour. Under one of the creams or pastes this condition is usually found to progress favourably, with the production of a firmer horny layer and the disappearance of the oedema ; but in certain cases the disease seems to become rebellious at this stage, and one cannot get the skin any farther towards recovery. This is especially so as

regards the legs, and in those cases where there is an embarrassed circulation due to cardiac weakness or varix. This is the stage and form in which Unna's gelatine dressing, modified from Pick's original formula, is almost invaluable. Before describing its method of application, I should however like to make a few remarks as to the cases in which it is *not* to be used. Any case in which discharge is actively taking place is unsuitable, for two reasons, viz., first for the reason that the paste contains a very high proportion of glycerine (at least 30 per cent.) and this, as you know, is a terrible irritant when applied to raw surfaces, and increases discharge by drawing water from the tissues; secondly, this being the case, the application refuses to set properly for the simple reason that it attracts so much watery fluid from the tissues that it is no longer capable of gelatinising on cooling. I believe a very valuable addition to our therapeutic resources has largely fallen into disuse from neglect of this indication.

The other case in which it is not to be used is in the presence of an enormous overgrowth of epithelium, which requires macerating off before the drug can come well into contact with the diseased area, or where a deep action of the drug is required, as drugs incorporated with the zinc-gelatine have only the most superficial action.

With these prefatory remarks, we may first describe the preparation and then its action. The best all-round formula is that containing 30 parts each of zinc oxide and gelatine, with 50 parts of glycerine and 90 parts of water. With this may be incorporated boric acid, or ichthyol (5 per cent.), but not salicylic acid. The application is melted on a water-bath, and the temperature allowed to fall until it is nearly that of the body, since it is bad to apply the paint too hot and gelatine does not set for a long time at a temperature a little above that of the body. With a soft pad of cotton-wool the part is carefully cleaned with a solution of boroglyceride or alcohol, and the melted gelatine is then thickly painted on. It is better to paint one thick coat than to attempt to put on two, because the application of the second coat is apt to tear up the first and make the application uneven. This having been done, one must wait a short time for the gelatine to set, and the surface is then either lightly dabbed with absorbent wool,

so that the surface becomes furry all over, or it is freely strewn with powder—the former and older method being in my opinion the better. Another pause is made for the gelatine to become still more solid, and then the felt of cotton-wool fibres is gently patted down on to the surface with the hand. If these directions are properly carried out an extremely neat application will result. Finally, if deemed advisable, a fine muslin bandage may be applied over all ; but I do not advise it, as it deprives the dressing of that elasticity which is one of its chief values. The action of the dressing seems to consist of (1) support, by the slight and gentle contraction of the gelatine, so tending to press out hyperæmia and to diminish œdema ; (2) protection from change of temperature, whereby alterations of the circulation are avoided and the vasomotor nerves given a complete rest, itching being also reduced to a minimum ; (3) lastly, owing to the hygroscopic nature of gelatine and glycerine, fluid such as sweat is absorbed in small quantities, while the evaporation from the outer surface renders this action continuous.

We may now pass on to the treatment of the chronic forms of eczema in which there is practically no discharge. Such cases may be roughly divided for our purpose into those with and those without marked overgrowth of the epidermis and sclerosis of the true skin. In those without overgrowth the application may be made, as one may say, directly to the surface without any previous denudation of the deeper parts. The application will usually be in the form of an ointment or plaster, since both of these are more or less macerating agents and by causing a locking-up of the moisture beneath them increase the absorption, and therefore the action of the drug. The active drugs which are chiefly used are tar ; pyrogallic acid ; strong applications of mercury, such as ointment of the nitrate in full strength or diluted ; sometimes chrysarobin, and iodine. It is always advisable, unless one has great experience in the treatment of eczema, to begin with a low proportion of the active drug, and increase its strength while watching its effects.

I should advise an ointment such as the following for a chronic eczema without discharge when first seen :—R : Ol. cadini, 10 minims ; ung. hydrarg. oleat. (B.P.), 1 drachm ; ung.

paraffini to the ounce. In a few days' time, if this does not appear to irritate, the oil of cade may be increased to half a drachm and upwards, until the desired effect is produced. Pyrogallic acid should be begun also in about one-per-cent. strength, and chrysarobin about four-per-cent. This last drug is only to be used in those cases which one has already proved by experience to be very tolerant of irritating drugs. I do not often use it in eczema, and never in very low proportions, because if the case does not require the drug in proportions as high as four per cent., it does not demand it at all, and one can arrive at one's object without using such a disagreeable and dangerous substance. Iodine is not often used, as far as I can ascertain, since one does not often see it advised in text-books ; but it is very valuable in some cases, and is best exhibited in solution with oleic acid and liquid paraffin.

In cases where there is great overgrowth, it is necessary to get rid of this before applying the drugs. The chief methods used are the application of a strong (five to ten per cent.) salicylic-acid ointment or plaster, painting with a solution of liquor potassæ, or scrubbing with soft soap. Now all these methods tend to produce a good deal of acute inflammatory reaction, and therefore it is not necessary or even advisable to use strong ointments after them, but on the other hand, after having freely removed the products of the disease, to dress the raw surface with soothing and protective applications. For this purpose the old ung. diachyli or the ointment of oleate of zinc is excellent. In using soft soap as a decortican one proceeds in the following manner :—Strips of thick linen or lint are spread with the oleate ointment in sufficient numbers to be sure that one has enough to cover the part. The part is then vigorously scrubbed with the spiritus saponis kalini (two parts of soft soap dissolved in one of rectified spirit), until it looks raw and shows points discharging either blood or serum. The part is then rapidly washed with lukewarm water to remove the soap, and the strips of linen applied and bandaged closely on. The process is repeated daily until the skin seems to be returning to normal. In some cases, especially where the disease attacks a freely-movable part, such as the back of the neck, the wrist, the back of the knee or the ankle, or where the part is subject to much friction, it will be found that careful

bandaging over the application has as much to do with the recovery as the drug itself, and in these cases especially, the application of the treatment in the form of a stiffish plaster is of great value.

Lastly, with regard to the vexed question of washing:—There is no doubt that in all cases of acute eczema and in many chronic varieties water alone is an irritant, and soap almost always is; the reason being in all probability that in the absence of a good protective horny layer the water, being of a different osmotic value from the serum, is absorbed by the cells, causing an increase of oedema and thus interfering with the normal attempt at healing. This being so, the difficulty can be met easily by adding some indifferent substance to it, to increase its density to about the same as that of the plasma. This can be done by adding oatmeal or starch or gelatine; and if this be done, it will generally be found that the skin bears it easily, and can be gently cleaned with the fluid, which is surely an advantage. In some cases, however—luckily rare—any form of wet application causes an intense and almost urticarial reaction of the vessels, and in these all watery applications must be carefully avoided.

In conclusion, I should like to impress upon you my belief that it is always of the utmost importance to use every effort to get at the error underlying the eruption that you see. In many cases this eruption will yield to ordinary local treatment without any enquiry into the processes at work, but in such cases, unless through some accident the patient is placed under different conditions, the disease will return. In other cases the eruption will be quite uncontrollable until you have elucidated these conditions. That in some cases it is impossible to get to the bottom of the trouble, I freely admit; but the more care we take, the fewer cases of the kind we shall meet, and consequently the less we shall believe eczema to be an obstinate and incurable disease, and we shall at all events avoid the pernicious, but comforting, doctrine that “it is better out than in.”

NOTES ON MEDICAL HISTORY IN EGYPT.

By F. M. SANDWITH, M.D., F.R.C.P.,

Consulting Physician to Kasr-el-Ainy Hospital, Cairo; Membre de l'Institut Egyptien.

IN prehistoric times the inhabitants of Egypt probably spent much of their time in hunting animals or in fighting among themselves, and must have been dependent on their friends, who washed their wounds and dressed them with herbs. The cleverest among these would gradually become empirical medical attendants.

The earliest hieroglyph or inscription for "a physician" is *Sennu*, which signifies wisdom or knowledge, and is represented by an arrow with a broken shaft, because the word for arrow was phonetically the nearest to the word for wisdom. This is analogous with the usage in other languages, such as "medicine" from *medh*, to be wise, "doctor" for the teacher, and "wise," "wit," "witch," and "wizard," all derived from the old English *wit*, to know; again, the Arabic *hakeem* has a similar etymology.

In the libraries of the Colleges of Physicians and Surgeons in London are copies of a photographic representation which I have had taken from the tomb of the earliest known physician, the stela of which is in the Cairo museum. This portrait dates from the Vth Dynasty (Sakkara), when surgery at least must have been well known, for in the anatomical museum of the Cairo medical school there are instances of fractures of the femur treated by four wooden splints enveloped in linen, which have been tied round the thigh with bandages. In another tomb of the Vth Dynasty (near Girgheh) the body of a child was found with a fracture of the radius and ulna, the arm being tied up with splints of bark, which had previously been wrapped round with linen. There had evidently been some haemorrhage in this case, for a little pad of fibre had been put over a wound under the splint.

The earliest known triumphs of the healing art were probably celebrated in Egypt, where the custom prevailed of

laying the sick people out before their houses, so that the passers-by might tender advice as to the treatment of their diseases. Later on, the priests included the healing art in their studies in the Temple schools, such as those at Heliopolis, Memphis, and Thebes, and believed that life should be indefinitely prolonged unless someone or something caused death, such as a spirit, or the soul of a dead man, which cunningly entered a living person. They, therefore, considered that they had two equally important duties to perform ; the first was to discover the nature of the spirit in possession, and the second to drive it out by powerful magic, reciting incantations, and making the patient wear amulets. Diet and drugs were afterwards prescribed to counteract the disorders which the strange being had produced in the body. It is interesting to notice this old belief, because the modern Egyptian is still unconsciously pursuing it.

Isis was the principal Egyptian deity who presided over the cure of disease, and she had the reputation of having recalled to life her son Horus. Imhotep, the Egyptian *Aesculapius*, who had a temple at Memphis, and Chonsu, "the counsellor of the sick," were of lower rank. The cat-headed Pasht and the Ape were worshipped as deities of lying-in women and of fecundity, for in all times the possession of children has been esteemed the greatest blessing among the Egyptians. Hence the cat was sacred to Pasht, and death was the penalty for killing one ; this may account, possibly, for the modern belief in Egypt that it is dangerous to illtreat a cat, especially about sunset, for what appears to be a cat is thought to be a spirit in disguise.

Thoth, generally represented with the head of an ibis, was esteemed as the inventor of science in general, and especially of the healing art, and is held responsible for six medical books, the fourth of which, now called the *Ebers Papyrus* (Leipzig), is the oldest medical book now existing. Though much of its contents is of far greater antiquity, it was not committed to writing until the time of the XVIIIth Dynasty. Several later medical papyri exist in Berlin and other European museums. We know that domestic medicine-chests were used by the old Egyptians, and that of Queen Mentuhotep, XVIth Dynasty, is now at Berlin.

Moses (Musa) was educated at Heliopolis, and the Pentateuch presumably tells us what was known in those days of midwives, circumcision, hygiene, leprosy and skin-diseases, &c.

The old Egyptian medicine degenerated into magic and alchemy long before it was succeeded by Greek knowledge. However, it is interesting to note that Isis and Serapis were still worshipped in Rome as medical divinities, and a temple in honour of Isis existed there as late as B.C. 50. It is unnecessary to point out that all the early civilisations of the world were indebted to Egypt. The earliest natural philosophy seems to have been introduced into Greece by Thales (639—544 B.C.), who was a pupil of the Egyptian priests; and Pythagoras (580—489 B.C.) seems to have learned the principles of his new medical philosophy by visiting Egypt.

Herodotus wrote with wonder of the number of physicians in Egypt, including specialists for the eyes, head, teeth, and internal organs; but the most remarkable thing about Egyptian medicine of that day was its non-progressive character. Knowledge stood still until the birth of Hippocrates (Abucrat, B.C. 460), who first separated medicine from philosophy. He is said to have been the son of a midwife, and though it seems doubtful whether he ever lived in Egypt, he has been adopted by the Arabs. He had great respect for the knowledge of the Egyptians, and said: "The physician must know what his predecessors have known, if he does not wish to deceive both himself and others." He is known as the "Father of Medicine," and forty-two of his clinical histories exist, besides many wise sayings. The famous oath which bears his name is probably authentic, and the latter half of it may be quoted here, as it represents some of the rules that should guide the physician to-day in the practice of his profession. "I will put my master, who taught me medicine, on the same level with the father who gave me life. I will regulate the way of living for the sick to their advantage, according to my power and judgment, and I will refrain myself from all evil and all injustice. I will not give poison to anyone, if I am asked for it, nor will I make such a suggestion. In like manner I will not give to any woman a pessary to cause abortion. I will spend my life and practise my art in innocence and purity.

"Whatever house I enter, I will go into it in order to be

of use to sufferers, avoiding every wilful and corrupting misdeed, and especially the seduction of women and of boys, free or slaves. Whatever I may see or hear in the course of my practice, or even outside the line of my professional duty, in the lives of men, that ought not to be noised abroad, I will not speak of, considering that such things should be kept secret. If I keep this oath without breaking it, may it be given unto me happily to enjoy life and the exercise of my art, ever held in honour among men. If I violate it, and become a perjurer, may the opposite fate be my lot."

Anatomy was chiefly studied on animals, and physicians were necessarily ignorant of it until human dissection was allowed for the first time for a few years about B.C. 300 in Alexandria. We are indebted to Celsus for most of our knowledge of the Alexandrian school, which remained famous till A.D. 300. The anatomist Herophilos was one of the heads of this school, and is reported, when asked "Who is the best doctor?" to have answered: "He who knows how to distinguish the possible from the impossible."

Greek physicians continued to travel to Egypt, where they studied at Heliopolis, until the Ptolemies inaugurated the school of Alexandria for the followers of Herophilos and his rival Erasistratus, who became famous lithotomists. Galen, the Greek, studied medicine in Alexandria about A.D. 147-158, and later settled in Rome, where he continued his anatomical studies, as far as possible on men and animals, but always advised his pupils to visit Alexandria, because there they would have the advantage of demonstrations on real human bones.

In the time of Galen, Alexandria was the centre of the intellectual world, but during the decline of the Roman empire interest in science decayed more and more, and medicine again degenerated into magic, astrology and alchemy, which last was nothing but a series of efforts to make gold. Paul of Aegina, the surgeon and obstetrician, was a pupil in Alexandria before that city was captured by the Kaliph Omar, for during the whole of the Byzantine empire the best physicians were educated wholly or partly at that school. But in A.D. 500 human dissection had long been disallowed, the Alexandrian school had decayed, and the Nestorian Christians, who had migrated from Alexandria to Syria, were forced to settle in

Persia, where their medical teaching spread. Here was taught Harit ibn Kaldah who, though a Christian, was highly thought of by the Prophet Muhammad and the first Kaliph, Abu Bekr.

It was about this time (A.D. 597) that civilisation and medical learning were introduced from Rome into Saxon England by Christian monks.

A large book of Coptic medicine, dating from the 8th century, containing 201 prescriptions for diseases of the eyes, stomach and uterus, fistulæ, scabies and other skin-diseases, can be seen at the Library of the French Institute of Archæology in Cairo.

For 500 years (750-1250 A.D.) Arabic writers now represented the highest form of medicine, and the literary Arabic language was formed and spread over nearly half the then known world. Muhammad ibn Ishak, the author of the *Fihrist*, says that the first translations from a foreign tongue, which were made under the rule of Islam, were works on medicine, alchemy and astronomy, translated from Greek into Arabic by the order of the Prince Khalid ibn Jazid, who had been taught medicine by Marianus, a Christian monk, probably once a teacher in the Medical School of Alexandria. The Abbaside rulers of Egypt, especially Haroun el Raschid and his son El Mamoon, caused the prolific works of Galen, those of Aristotle, and other classics of the day, to be done into Arabic.

In the middle ages physicians were well protected by their royal masters, and often rose to the rank of Vizier. Among those specially worthy of mention are Abu Bekr Muhammad ibn Zechariah Rhazes, who first wrote on small-pox and measles, and was called "The Experimenter"; Sinan ibn Tsabet, who introduced medical examinations for licence to practise; Isaac ben Solomon, an able representative of the Jews, who were very prominent in medicine during the ninth and following centuries; Ali ibn el Abbas el Madjoussy, author of the *Maleki*; Abu el Kassim el Zahraoui, who wrote the first independent work on surgery, which was also the first illustrated treatise on that art; Abu Ali el Hussein ibn Abdulla ibn Sina (Avicenna), famous as a doctor, astronomer, poet, philosopher and statesman, whose tomb at Hamadan in Persia is still visited by sick people in search of health, and whose

"Canon," translated into Latin, formed, for four centuries, the chief text-book of European medicine ; Abu Merwan Abdel-malek ibn Zohr (Avenzoar), the greatest and most original physician of the twelfth century ; his pupil Muhammad Abu el Walid ibn Achmed ibn Roschd (Averrhoës) ; the Rabbi Maimonides, who left Spain for Egypt and became one of the medical staff of Yusuf Salah el Deen (Saladin) ; Mouaffaq el Deen Abu Nasr Adnan ibn el Ainy, who taught medicine and wrote books in Egypt ; Ibn el Faris, who also wrote several medical books in Cairo ; and Abdullah ibn Achmed Dhia el Deen called Ibn Baitar, the most famous botanist of the East, who was for a time chief apothecary of Egypt, and wrote the Djami el Moufridat, the *Materia Medica* of that day, and was given the title of "Master" by the Cairo Academy.

According to Makrizy, the first hospital in Egypt was established by Ibn Tulun about A.D. 875, and contained a section for lunatics. The Kaliph visited it every Friday, till a lunatic threw an apple at him, after which he came no more, though he still took an interest in the place. Kafur's hospital was built in the year 957, and Leclerc tells us that in the tenth century there was another hospital in Old Cairo.

In 1005, El Hakim founded the "House of Wisdom" in Cairo, which was practically a university where medicine was taught besides other sciences. And another university was started in Alexandria under the Fatimites in imitation of the famous school of that city. At the end of the twelfth century there were several doctors at the Nasry Hospital in Cairo, and in the beginning of the thirteenth century Ibn Abu Ossaibiah gave his services to the Noury Hospital ; both these hospitals were founded by Saladin. Abdul Latif, of Bagdad, taught medicine in and after A.D. 1193 in the Azhar University in Cairo, and refuted some of Galen's anatomical errors.

But the most remarkable medical foundation in Cairo was the Muristan, built by El Mansour Kalaoun in 1286, for he endowed it with money for wards and out-patients, and desired that all should make use of it, rich and poor, great and small, bond and free. His luxurious scheme included doctors with fixed salaries, male and female nurses, and special wards for fevers, wounds, ophthalmia, diarrhoea, phthisis and obstetrics. He evidently intended his gift to be a general hospital, but its traditional reputation is chiefly that of a madhouse, and

it remained, in fact, the only lunatic asylum in Cairo until about 1856. The ruins of the Muristan have now been utilised by the Wakfs in 1903 as an eye-dispensary. Makrizy also describes the Moaiyud hospital at Cairo, which was opened for a few years about 1420.

The Arabs kept alive the torch of medical science, and passed it on to their successors, burning more brightly than ever, though they made no discoveries of capital importance. This was partly due to the impossibility of dissecting, so that anatomy and physiology remained at the point they had reached in Galen's time; while operative surgery lost ground, so that tracheotomy, extraction of cataract, and many amputations were no longer considered safe, and the knife was superseded by caustics and cauteries. The Arabs were, however, more interested in practical medicine, and they invented the profession of apothecaries, whom they called "Sandalani," from the great amount of sandal-wood they employed. The higher teaching-institutions of the Arabs lasted till the fourteenth century, and then decayed more or less rapidly under the dominion of the Mongolian and Turkoman tribesmen. But in the Christian lands of Europe the seeds of Arabic culture developed into the vigorous intellectual growth of the medical schools of Salerno, Montpellier, Padua and Bologna. At the last-named University Mondino published in 1316 his "Anatomia," which was the first work founded on actual dissection of human subjects since the days of the anatomists of Alexandria. From the Italian schools medicine was transmitted to England and Germany, and it is interesting to note that the Western nations are to-day but restoring to Egypt the modern fruits of that knowledge which was for so many years almost a monopoly in the famous cities of Memphis, Heliopolis and Alexandria. So late as 1481, the Arabist school still led at Tübingen, where the text-books numbered six Arabic to three Greek works in the newly-founded University; but in Egypt everything medical dwindled and decayed until there were no hospitals or schools left.

In 1820 Muhammad Ali Pasha, under pressure from Europe, laid the foundation of a military sanitary service in Egypt, and five years afterwards, under French guidance, the first Board of Health was established, and means were taken for treating also the civilian sick and wounded. During the French occupation,

in 1799, Kasr el Ainy palace was turned into a military hospital, and Baron Larrey studied various diseases there and lectured to the midwives. Bonaparte also ordered a Commission to prepare a plan for organising a civil hospital for the sick of Cairo, and a hospital of 300 beds was then opened in the Ezbekieh quarter. Both these hospitals were disused when the French left Egypt. Kasr el Ainy was turned into barracks, became a ruin, was rebuilt by Muhammad Ali in 1812, and then became a preparatory school till 1837, when Clot Bey succeeded in getting leave to transfer to it the hospital and medical school which he had started in 1827 at Abu Za'abel. The medical school is thus the earliest of all the government schools in Egypt, and was called into existence by the ravages of plague and cholera in Egypt between 1824 and 1840. The names of the European professors that deserve mention are : Clot Bey, who, besides vaccination, introduced into modern Egypt hospitals, schools of medicine, pharmacy and midwifery, sanitary and quarantine departments, all of which in an improved form still exist ; Pruner, Griesinger, Bilharz, and Reyer. Kasr el Ainy hospital and school after 1858 were left chiefly in the hands of Egyptian professors educated in Europe, and were not productive of any scientific work. The Board of Health, which regulated the whole of the interior of Egypt except the army, having been separated in 1881 from the Quarantine Department, which became responsible at the different sea-ports for preventing the introduction of human and animal diseases from abroad, proved to be so incompetent during the 1883 epidemic of cholera that it was swept away among the earliest British reforms in 1884.

Since then a new era has begun. We have hospitals all over Egypt, extending into the Soudan ; a Sanitary Department, famous even outside Egypt for its practical methods of stamping out epidemic diseases ; a veterinary school ; a model Oriental hospital at Kasr el Ainy ; and a completely new School of Medicine, which has necessitated the creation of various necessary departments which never existed until the occupation of the country by England.

Though it is now more than twelve centuries since Egypt has been under Muhammadan sway, and even longer since Christianity was introduced, there are many evidences that the

bulk of the people, who are quite uneducated, still unconsciously continue some of the beliefs of the Ancient Egyptians. They believe that the dead can feel, and should be treated with respect similar to the living, and that their dead relatives in the cemeteries must be visited on important feast-days. Innumerable remedies exist to counteract the dreadful effects of the "evil eye"; cornelian and charcoal are put on children's foreheads for this purpose, and a monkey or gazelle is often kept in the house as a preventive. Phallic worship is by no means forgotten, and certain statues in the Cairo museum of antiquities are regularly visited by barren women. Women desiring children will also step over the body of an executed criminal, or into a basin of water that has been used to wash his corpse, or tread on a human skull, or beg leave to visit the dissecting-room, or walk between the tombs of a cemetery, or step over a bronze statue of a cat or other deity of ancient Egypt. Fevers are cured by wearing any bone which belonged to an unbeliever or to a mummy. The lowest classes often seek no medical help until the patient is moribund, but they have great faith in written charms, which usually consist of passages from the Koran for Muhammadans, and of the Psalms and Gospels for Copts, intermingled with numerical combinations, diagrams and symbols; these are worn as amulets to prevent or cure disease. Evil spirits prowl about at dusk, in the body of a cat, and can easily be transferred to a healthy person, who then gets paralysis or some other nervous disease of which he can only be cured by visiting certain mosques or Coptic convents.

The varied history of Egypt must never be forgotten by the investigator who wishes to study the modern habits and customs of the people.

REFERENCES.

- Baas : *Outlines of the History of Medicine*. New York. 1889.
 Puschmann : *History of Medical Education*, translated by E. H. Hare. London 1891.
 Withington : *Medical History*. London. 1894.
 Leclerc : *Histoire de la Médecine Arabe*. Paris. 1876.
 Wustenfeld : *Geschichte der Arabischen Aerzte*. Göttingen. 1840.
 Sprengel : *Histoire de la Médecine*. Paris. 1815.
 Sandwith : "Earliest known Physician," *Lancet*, 1902, ii., p. 522; and
 "History of Kasr-el-Ainy, A.D. 1466-1901," in the *Records of the Egyptian Government School of Medicine*, 1901.

SOME RECENT WORK ON SO-CALLED
CHRONIC METRITIS AND ENDOMETRITIS, AND
THEIR RELATION TO THE LIFE-HISTORY
OF THE UTERINE MUSCLE.

By W. E. FOTHERGILL, M.A., B.Sc., M.D., Manchester,

*Assistant Physician to the Northern Hospital for Women; Lecturer on Obstetrics,
Victoria University.*

[With Plate XVII.]

EVERYONE has heard of the student who, when asked to define inflammation, replied that it began with pain, heat, redness, and swelling, and ended with *-itis*. There are, however, certain conditions whose names end in *-itis* which do not begin with the classical signs of inflammation, and cannot be regarded as the result of irritation either microorganismal, chemical, or mechanical.

To take a single example :—A young married lady menstruated regularly until her first pregnancy, the duration of her periods being five days. She lived in the country, far from her doctor, who managed her first confinement on the "expectant" principle. Labour was very prolonged, and though the puerperium was absolutely free from fever, recovery was incomplete. The menstrual periods subsequently lasted eight or nine days instead of five, and there was profuse leucorrhœa during the intervals. The patient was said to be suffering from *endometritis*, and this condition continued for four years, after which she again became pregnant. Dreading another prolonged labour, she entered, towards term, a nursing-home in town and engaged the services of an obstetrician who, in the words of Professor Simpson, "has less patience and consequently more patients" than some of his colleagues who leave more to nature. The confinement was easy and natural, involution was normal, and the puerperium was quite satisfactory in all respects save one ; namely, a coloured discharge continued for eleven weeks. Ten days later it returned and lasted two weeks. The next two periods lasted for ten days, the following period for seven days ; and then the patient became pregnant for the third time.

As above mentioned, this lady was said to have chronic endometritis dating from the time of her first confinement. But she never had any inflammatory condition at all. She never showed a sign of infection by any organism, and her endometrium was never irritated by the local application of medicaments.

Every practitioner can recall cases in which menorrhagia, metrorrhagia, and leucorrhœa have appeared without any assignable cause, and have persisted in spite of careful and prolonged treatment. It has been customary to describe these cases as chronic endometritis and metritis, and in the early days of gynaecology a great deal of literature dealing with them was published at home and abroad. But the conditions referred to have never been understood, and of recent years they have received very little attention. For this there are two main reasons. In the first place, rapid advances in the more exciting field of major gynaecology have attracted the interest of the profession almost to the exclusion of minor diseases of women. Secondly, when bacteriology came to the fore, it was quickly seen that many of the conditions included under the terms endometritis and metritis were the definite results of infection by one microorganism or another. By false analogy, it appears to have been assumed that all conditions at all resembling these must also be the result of infection, whether the source and date of this infection could be discovered or not.

There are, however, numerous states, still named "endometritis" and "metritis," which are now recognised as non-infective in origin. Thus, in France, a "*métrite des vierges*" is described, and in Germany, some writers use the term "*essentielle Blutungen*" for certain forms of menorrhagia. The pathology of these conditions remains obscure and demands elucidation. Several efforts have recently been made in this direction, and it is to some of these that the reader's attention is invited in the present review.

At the December meeting of the North of England Obstetrical and Gynaecological Society, Dr. Donald read a paper on "Chronic endometritis and chronic metritis in virgins." This title, he said, was not a satisfactory one, from a pathological point of view, for the condition to which he referred was not

one which at the present time could be regarded as inflammatory. The term "Idiopathic endometritis" might be used, but was open to the objection that it meant nothing. Benign adenoma of the endometrium would also describe the condition, but might suggest hyperplasia rather than the hypertrophy which was observed. But it was still frequently described as "endometritis and metritis," and the avoidance of these terms would probably cause more confusion than their use would bring about. The cases he referred to were those of chronic endometritis and metritis, so called, occurring apart from septic infection and other obvious causes ; he therefore excluded all conditions of the uterine wall and mucosa which occurred in connection with new growths and with tubercular processes, and in membranous dysmenorrhœa. In selecting 40 cases for tabulation and analysis he had included none but those which were virginal beyond doubt. Cases of sterile married women were excluded because the lesions they presented might possibly be infective in nature. The 40 cases discussed had all been observed for prolonged periods, most of them having been seen in private practice. Three main groups of cases occurred. In the first and largest group the cervix was small, and there was acute anteflexion or retroflexion ; but whether the flexion was backward or forward, was regarded as accidental and unimportant. The body felt small ; but on examination under an anaesthetic, it was found to be enlarged and elongated. There was often stenosis in some degree ; the isthmus was thin and soft. In the second and smaller group of cases, there was an ordinary cervix and a large heavy corpus uteri, either anteverted to excess or retroverted. The third and smallest group was marked by hypertrophy of the cervix and cervical catarrh. As to the symptoms, pain in the lower abdomen was complained of in 36 of the 40 cases. Dysmenorrhœa was present in 33 ; leucorrhœa in 31 ; menorrhagia in 16.

The uterus had not been removed in any of these cases, clinical observation and the examination of scrapings removed by the curette being the methods of investigation employed. The curette generally brought away strips of endometrium, $\frac{1}{4}$ -inch or more in thickness. These had been microscopically examined in several cases. The glands were generally normal in structure, but increased in number. The interglandular

tissue was either swollen and oedematous, but poor in cellular elements; or else it was normal in appearance. That is to say, there was general hypertrophy of the mucosa. In some cases (*see* Fig. 1) the interglandular tissue was more fibrous than the normal stroma of the endometrium. The vascular structures presented no marked changes.

The treatment invariably employed was curetting. In 26 cases which had been followed up completely, there were 24 which were greatly benefited, 14 of them being really cured and 2 not being improved. Removal of the uterus was not required in these cases. It was not right to leave them alone, and curetting gave very satisfactory results. The displacements observed were not primary, and often remained after the patient was cured; therefore the use of pessaries in these was condemned as unnecessary and ineffective. Ventrification alone had been found insufficient. In one case this operation had been performed without relief to the symptoms which had yielded to curetting 6 years later. Dr. Donald pointed out that the main pathological feature of these cases was hypertrophy of a glandular structure—the uterine mucosa. This was associated with hypertrophy of the wall of the uterus. The poorly-developed cervix observed in the majority of the cases might afford a clue to the origin of the condition, but was not easily explicable. He referred to the work of Lorentz, Theilhaber and others which, however, dealt almost entirely with cases in which septic infection was probable, and in which bleeding was the chief symptom, and therefore did not directly bear on the subject of this paper.

In the transactions of the same Society for March, 1903, Dr. Donald published a case of "so-called idiopathic endometritis" which is also of special interest. The patient was a married woman, aged 32. She had suffered almost continually for ten years from a red discharge from the vagina. Metrorrhagia began at the age of 21, and had gradually become worse. The cervix uteri was conical and small; there was acute anteflexion. The curette brought away scrapings which on microscopic examination showed dilated gland spaces (*see* Fig. 2). This was in June, 1891, and, as little benefit followed the operation, she was again curetted, with more success, a few months later. In June, 1895, she married, and soon had an

PLATE XVII.

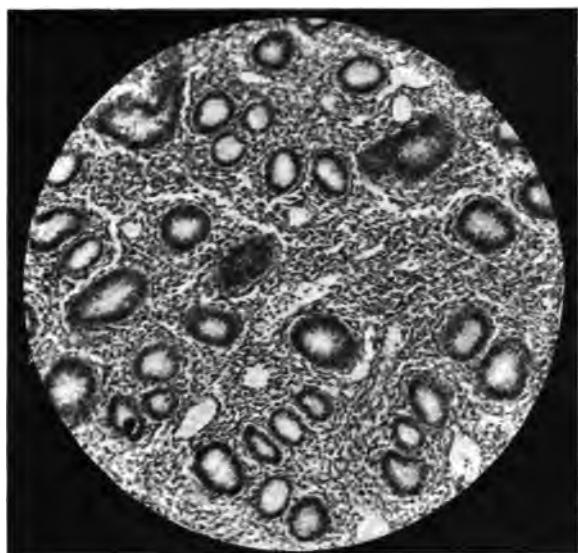


Fig. 1. Photo. by Dr. Orr of section from one of Dr. Donald's cases of so-called metritis in virgins.

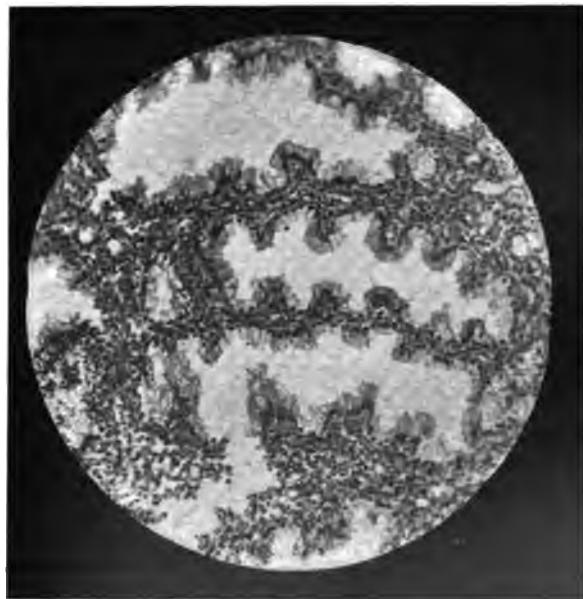


Fig. 2. Photo. by Dr. Orr of section from Dr. Donald's case of so-called idiopathic endometritis.



early abortion, followed by continuous haemorrhage. She was curetted for a third and a fourth time, but in the next six years she was never free from bleeding for 16 days together. In 1902 she was again curetted, and atmocausis was tried. The haemorrhage returned in six weeks. Anæmia then became pronounced, and the uterus was therefore removed. The corpus uteri was somewhat enlarged, and consisted almost entirely of fibrous tissue, so firm that it was found practically impossible to make satisfactory sections of it for microscopic examination.

In the *Journal of Obstetrics and Gynaecology of the British Empire* (January, 1904) Dr. W. K. Walls published a case of severe metrorrhagia at puberty. The patient was a girl who began to menstruate at the age of 13 years and 4 months. She had two ordinary periods with a normal amount of discharge, and then a third period with rather scanty loss. The fourth period began in December, and continued till the following April. The discharge was copious, most heavy at night or in the early morning, and frequently contained small clots. The condition did not yield to medicinal treatment, and the use of ergot seemed to make it worse. The girl became extremely anaemic, and frequently fainted when her head was raised from the pillow. On vaginal examination the cervix was found to be rather large and of flabby consistence, the external os was wide, and the uterus was anteflexed. It was $3\frac{1}{2}$ inches in length, and its canal was easily dilatable. The curette removed many smooth strips of thick pale endometrium. Discharge continued for two weeks, and then ceased, except at the ordinary menstrual periods, which have remained normal for eight months. There was no history suggesting the presence of any retained products of conception, and this possibility was entirely negatived by the conditions observed at the curetting. There was also no history of any infection. Microscopic examination of the tissue removed showed the endometrium generally hypertrophied; the glands themselves were not for the most part increased in size, but here and there were one or two of unusually large lumen. There was no great increase of the vascular structures.

In the discussion upon this case an interesting point was mentioned by Professor W. J. Sinclair, who had treated similar

cases by making the patient wear a stem-pessary. This acted as a foreign body, and stimulated the uterine muscle to contraction, thereby favouring its nutrition and improving its development. The uterine stem also exerted pressure upon the hypertrophied endometrium, and thus tended to reduce the exuberance of its growth. This treatment was based upon the idea that the cause of the condition was hyperæmia due to defective development of the uterine muscle. This idea has been worked out in a series of interesting papers by Theilhaber and his assistants.¹

Theilhaber points out that, of those who consult a ladies' doctor, a large percentage complain of excessive bleeding and of leucorrhœa. In a portion of these cases the cause is easily discovered. In cancer of the cervix, for instance, the origin of the discharge is clear ; and if gonorrhœal infection is proved, an inflammation of the endometrium is recognised as the cause of the discharge. In the cases where the cause is not clear, the presence of a chronic inflammation of the endometrium is commonly assumed. Theilhaber holds that this assumption is generally wrong, and that what is regarded as primary endometritis is really a secondary hypertrophy, the result of a primary lesion of the mesometrium. Similarly chronic metritis is often supposed to be an inflammation of the mesometrium secondary to infective inflammation of the endometrium. Theilhaber holds that in a great mass of cases called "metritis" there is no primary inflammation of the endometrium, but a primary defect on the part of the uterine muscle and a secondary hypertrophy of the endometrium.

Uterine contractions play a great part in regulating the circulation in the pelvic organs. The uterine muscle contracts not only during pregnancy and labour, but throughout life. Its contractions are weak and few in childhood and in old age ; they are stronger during reproductive life, and very powerful during menstruation. It is owing to muscular action that bleeding often stops during menstruation for hours together. If the legs are allowed to hang down motionless they become ædematos through venous stasis. Persons who stand a great deal are subject to varicose veins. Those who walk are not

¹ *Archiv f. Gyn., Vol. LXVI., Part I., and Vol. LXX., Part II.*

thus affected, because muscular action helps in returning the venous blood to the heart. Similarly uterine contractions empty the uterine veins and those of the other pelvic organs. Pelvic congestion is favoured by inactivity on the part of the uterine muscle. This is especially marked during menstruation, when the pelvic vessels are full of blood and when uterine contraction is needed to regulate and finally to end the period of haemorrhage. If the uterine muscle is inefficient, the period is prolonged and there is inter-menstrual leucorrhœa. If venous stasis becomes a chronic condition, there is over-nutrition and hypertrophy of the tissues, and thus are produced the conditions which are wrongly named endometritis and metritis.

The development of the uterine musculature proceeds as a rule parallel with the development of the blood-vessels. In childhood and in age there is little muscle, and the blood-vessels have narrow lumina. During reproductive life there is more muscle, and the blood-vessels are larger and more numerous. The life history of the uterine muscle may be expressed in a curve thus :—

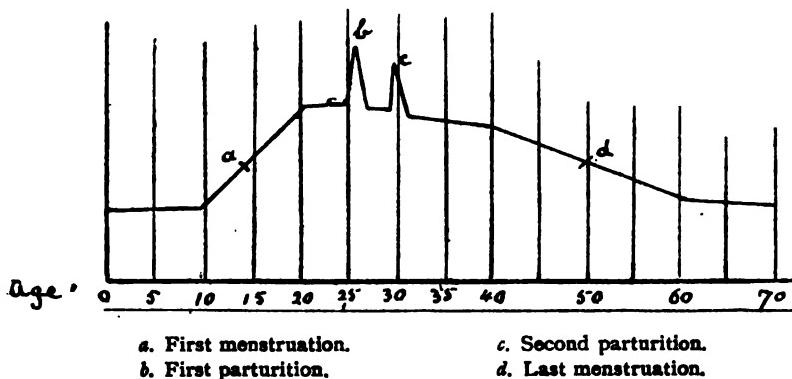


Fig 3. Curve modified from Theilhaber to show quantity of uterine muscle at different ages.

In the child's uterus only about one-third of the tissue is muscle, and the blood-vessels are narrow and thin-walled. The rest of the organ (*i.e.* two-thirds) is composed of connective tissue. Towards the approach of puberty, the muscle and the vessels begin to increase. The connective tissue thus becomes relatively less in quantity. This change goes on for

some years—say between the ages of 10 and 20—both before and after menstruation begins. At the end of this time the uterus contains twice as much muscle as connective tissue. The proportions are reversed. Two-thirds is muscle and one-third is connective tissue. In a healthy woman, provided that pregnancy does not occur, this proportion of 2 to 1 between muscle and connective tissue is maintained for the next 20 years or so, *i.e.*, until she is 40 years of age. When a pregnancy occurs, the muscle and connective tissue both increase rapidly up to the time of parturition and then fall quickly back. The uterus remains larger after pregnancy than before, but the increase is due to the presence of additional connective tissue, not to muscle. The proportion of muscle to connective tissue thus falls after each pregnancy to a figure lower than that at which it stood before. In other words, the connective tissue does not return to its previous condition after labour so completely as does the muscle; there is, in fact, a little more connective tissue and a little less muscle after each pregnancy than before it. The average weight of the nulliparous uterus is 35 to 40 grammes according to Demange; or 40 to 50 grammes according to Gebhard. The parous organ, according to both authorities, weighs 60 to 70 grammes. Fritsch is also of opinion that this increase in weight is due to increase of connective tissue. He found that in health the size of the uterus varies directly with the number of pregnancies.

Another change begins, as a rule, several years before the last menstruation. The muscle-fibres atrophy, the walls of the vessels are thickened, and their lumina are lessened by a kind of physiological arteritis obliterans; the connective tissue increases in amount. When the menses cease, this process is far from complete; it continues from year to year, until, by the time the age of 60 is reached, the uterine muscle is as small, relatively to the connective tissue, as it was in childhood, forming only one-third of the bulk of the organ. The blood-vessels, however, are very different from those of the child, for their walls are thickened enormously by the formation of connective tissue in and around them.

If the circulation in the uterus is to proceed normally, it is essential that the contractile force of the uterine muscle shall

be proportionate to the width of the blood-vessels. With the narrow vessels of the child and the old woman, occasional weak contractions suffice to prevent venous stasis. With the high vascularity of reproductive life much greater muscular activity is demanded. Uterine muscular inefficiency may thus be regarded as the cause of a number of conditions with which all are clinically familiar.

Just after puberty, menstruation is often excessive. A girl bleeds for three or four weeks at a time, often profusely ; and the haemorrhage is repeated with intervals. At first the uterus is found to be small and flabby. The condition, however, may persist for years, in which case the organ gradually becomes enlarged. The mucosa, as examined after curetting, is found to be normal at first, hypertrophied later. The explanation is that the two developmental changes, increase of blood-vessels and increase of muscle, have not kept time. The vessels have grown earlier than the muscle-fibres, with the resulting menorrhagia. The uterus is at first small and flabby for want of muscle ; but gradually venous stasis causes hypertrophy of the mucosa and of the connective tissue, and ultimate enlargement and hardening of the organ. In most of these cases of menorrhagia at puberty muscular development follows the increase in vascularity in a few months, and all is well as soon as the due relation between muscle and vessels is restored.

Theilhaber would doubtless apply this explanation in the above-mentioned case recorded by Dr. Walls. The failure of ergot to reduce the haemorrhage would become clear on the supposition that the uterus did not contain enough muscle for the drug to act on. The use of the curette would be regarded as a stimulant to the development of the whole organ, sufficient to bring about the improvement in muscular tone necessary to stop the bleeding.

The approaching climacterium is perhaps the commonest cause of so-called chronic metritis. In women during the pre-climacteric period, the presence of an enlarged, thickened, generally soft, but also sometimes hard, uterus with an enlarged cavity is extremely frequent. The primary change is atrophy of the musculature—the one unvarying factor in approaching senility of the sexual organs. Physiologically, this muscular atrophy is accompanied by stenosis of the vessels and a

lessening of the blood-stream in the organ. If from any cause this vascular change is delayed until the muscle-fibres have atrophied, muscular insufficiency permits of venous stasis and engorgement. This in turn leads to hypertrophy of the connective tissue, which completes the picture of chronic metritis so-called. Pre-climacteric menorrhagia and metrorrhagia are the leading symptoms of this state. Later, as stenosis of the blood-vessels occurs, the bleeding stops, but the uterus remains enlarged. If these patients are watched for years, it is found that gradually after the cessation of haemorrhage the whole organ again becomes reduced in size by senile atrophy.

Frequent parturitions produce a similar condition, for normally there is more connective tissue and less muscle in the uterus after every confinement than before it. In fact the size of the uterus varies directly with the number of pregnancies completed. Over-exertion of the uterus in deliveries through contracted pelvis must be recognised as a special cause of muscular atrophy during early reproductive life.

This consideration affords an explanation of the case of so-called endometritis mentioned on the first page of this paper. The patient, normal up to her first confinement, had a prolonged labour. This so exhausted her uterine muscle that after the puerperium her uterus was considerably less muscular than before, the menstrual period being accordingly increased by some days. Her second confinement, though not unduly prolonged, accentuated the muscular insufficiency, and was followed by a period of menorrhagia which disappeared under general treatment, and without the use of any local therapeutic agency. Had this muscular weakness continued much longer, hypertrophy of the connective tissue would have followed, causing enlargement of the uterus. This physical sign would have justified a diagnosis of "sub-involution," which, according to Theihaber, is *exaggerated* muscular atrophy during a puerperium, followed by hypertrophy of connective tissue, and not, as is generally taught, an *incomplete* physiological post-partum atrophy of the uterine muscle. In fact, sub-involution is what we usually call super-involution plus hypertrophy of connective tissue due to vascular stasis.

Another type of uterine muscular inefficiency includes muscular degeneration due to general disease. Chlorotic girls,

for instance, often have profuse, indeed excessive, menstruation, sometimes accompanied by leucorrhœa. The cause may be regarded as degeneration of the uterine muscle resulting from the general anaemia, just as alterations of the heart-muscle occur in the same disease. The condition often lasts long enough for venous stasis to cause hypertrophy of connective tissue, and endometrium with enlargement of the uterus as a consequence. Other examples of bleeding due to degeneration of muscle may be seen in exhausting diseases like phthisis, and at the commencement of acute infectious diseases whose toxines act quickly on muscular tissue.

Dr. Anton Meier has made microscopic examinations of 61 uteri with the object of ascertaining the variations which occur under different circumstances in the structure of the mesometrium. He employed a method of staining his sections which clearly differentiates muscle from connective tissue, and has attempted to express in percentages the relative quantities of each found in the various uteri. The uteri examined were obtained from subjects of all ages ranging from 5 months up to 75 years. The cases are all described separately and tabulated, and the results of the writer's observations are analysed. These results were briefly as follows:—The curve derived by Theilhaber from clinical observation is shown by microscopical examination to be essentially correct. The preparations prove that the uterine muscle is reduced in quantity after each labour, and that exhausting diseases also exert an unfavourable influence upon it. For many years before the menopause the muscle of the uterus is reduced in quantity. In cases of pyosalpinx muscular atrophy was observed. While fibromyoma usually causes an increase of uterine muscle, there is often a relative increase of connective tissue in cases where haemorrhage is pronounced. The arterial walls are thickened very often after pregnancy, even in quite young women. They are also thickened as age advances from 35 upwards.

Lorentz¹ has investigated nine uteri extirpated on account of persistent haemorrhage. The clinical features of these cases were those usually associated with the name "chronic metritis." There was always considerable enlargement of the uterus, with thickening of its walls. The cavity was generally

¹ *Archiv für Gyn.*, 1903, Vol. LXX., Part II.

increased in size. The tissues were soft and flabby, with numerous vessels. The mucosa was not always thickened, and the serous covering was normal. Microscopic examination revealed marked increase of connective tissue, with relative loss of muscle. The hypertrophy of connective tissue was not uniformly distributed, but was specially obvious in certain places. The mucosa showed no alterations of importance beyond hypertrophy.

In view of the microscopic work of Meier, Theilhaber proposes to divide the conditions known as chronic metro-endometritis into two groups :—

A.—Primary endometritis with or without secondary mesometritis.

B.—Primary disease of the mesometrium with or without secondary hypertrophy of the meso- and endo-metrium.

Under A. fall infective conditions of the endometrium, gonorrhœa, puerperal fever, occasional cases of tuberculosis, and the like. In chronic cases the mesometrium will also be involved in a secondary manner.

Under B. come hypertrophy of the virgin uterus, muscular degeneration from general disease, uterine fibrosis following disease of the appendages, subinvolution, changes due to the presence of fibroid tumours, and the changes in the senile uterus. Infection of microorganisms has nothing to do with any of these, although such uteri have, of course, no immunity against the attacks, for example, of gonococci. Thus inflammatory changes may occur in any uterus together with the results of muscular insufficiency.

The papers reviewed above are to some extent complementary to one another, and taken together they give a mental picture of a group of uterine conditions which, if not finished in every detail, is at least full of interest and of suggestion. Dr. Donald's carefully selected series of 40 cases in which infection was excluded certainly proves the existence of a non-inflammatory condition, in which the main symptoms are pelvic discomfort, menorrhagia and leucorrhœa, and the most obvious pathological feature is hypertrophy of the uterine mucosa. The cases studied by Theilhaber, Meier, and Lorentz were in many instances of infective origin ; but this does not impair the value of their observations on the relation-

ship of uterine muscular insufficiency to hypertrophy of the endometrium and of the connective tissue of the mesometrium. For this relationship must remain practically the same both in the absence and in the presence of inflammatory changes. Without accepting the conclusions of these workers as final, it must be recognised that they are based upon a serious study of the life-history of the uterine muscle, and are thus satisfactory in as much as they are founded on facts of development. From muscular inadequacy due to developmental errors, the extension of the theory to include similar defects owing to disease and exhaustion of the uterine muscle is simple and natural. In fact, it must be allowed that the uterine muscle plays a greater part in the causation of common pelvic disorders than has hitherto been recognised.

It must also be allowed that the application of names ending in -itis to conditions of non-inflammatory origin is not in accordance with the spirit of modern pathology. "Endometritis" and "metritis" must be reserved for infective cases, and must not be applied whenever the symptoms of leucorrhœa and menorrhagia are mentioned.



A REVIEW OF RECENT WORK IN OPHTHALMOLOGY.

By E. TREACHER COLLINS, F.R.C.S.,

Surgeon, Royal London Ophthalmic Hospital; and Ophthalmic Surgeon, Charing Cross Hospital.

THE THERAPEUTIC USE OF X-RAYS IN DISEASES OF THE EYE.

THE employment of X-rays for the treatment of trachoma seems to have been first suggested and successfully carried out by Mr. Stephen Mayou. He showed a case which had been so treated at the Ophthalmological Society¹ on June 12, 1902. It was a typical case of trachoma, affecting both eyes, with large flattish granules, and pannus at the upper part of each cornea. After 24 exposures of three minutes' duration given to the left (the worse) eye, at a distance of 9 inches from the tube, all granules had disappeared from the lids and fornices, and the cornea had practically cleared. The right (the better) eye, which had been treated with daily applications of sulphate of copper, had not shown improvement to nearly the same extent.

Mr. Mayou claims as advantages of the treatment that :—

- (i.) it is free from pain ;
- (ii.) there is considerably less deformity of the lid afterwards ;
- (iii.) the pannus clears more thoroughly ; and
- (iv.) the period of treatment is shortened.

Since his first recorded case he has carried out this treatment in 15 others, and in his latest article² on the subject he describes his method as follows :—The patient is seated in front of a focus-tube, the head being supported by some convenient form of rest ; the upper lid is then everted and either held so by the fingers or by a Reid's clamp. If the fingers are used,

¹ "A Case of Trachoma treated by X-rays," *Trans. of Ophth. Soc.*, Vol. XXII., p. 95. *Archives of the Röntgen Society*, January, 1903.

² "The X-ray Treatment of Trachoma," *The Ophthalmoscope*, November, 1903, p. 174.

they must be protected by bismuth ointment and cotton gloves, a clean pair being kept for use with each patient. If there is no pannus, the cornea is covered by pushing up the lower lid, but in bad cases of pannus the cornea is exposed. The distance of the eye from the anode should not be more than 9 inches ; a self-regulating tube having a spark-gap of 4 inches and a current of 6 ampères is most suitable. Four minutes' exposure is given for six successive days ; a week's rest is then given, and if no reaction is set up, the patient is exposed three to five times a week until there is a slight increase in the photophobia, which shows that the patient is beginning to react.

Drs. Sydney Stephenson and Walsh¹ recorded on February 18, 1903, four cases of trachoma treated by X-rays. The method they adopted was the following :—The anti-cathode of the focus-tube was placed at an average distance of 8 inches from the eye, and the average exposure was from 10 to 15 minutes. After the first few exposures a mask of lead-foil was used to protect the face, and so made that one or both eyes could be exposed to the tube. An average current-strength of 5 ampères and 20 to 25 volts was used. In some of the cases the lids were everted, and in others not. The writers say the eversion, or otherwise, of the lids appears not to make the least difference in results. All four cases were either cured or immensely improved by the treatment.

In the discussion on one of Mr. Mayou's papers Mr. Stephenson mentioned later that he had used the treatment in 35 cases, and had never seen any complications of any moment, except thinning of the eyelashes and loss of hair in the eyebrows, and once dermatitis. His cases had recently been treated without shielding of the face in any way. He also spoke very favourably of treatment by high-frequency currents directly applied to the palpebral conjunctiva by a glass and sealing-wax electrode.

In speaking of the mode of action of X-rays in trachoma Mr. Mayou² says :—"In X-rays we have a method of setting up a leucocytosis with the absolute minimum of destruction of

¹ "On the Curative Treatment of Trachoma by X-ray Tube Exposure, and by High Frequency Current," *The Medical Press and Circular*, February 18, 1903.

² "The Treatment of Trachoma by X-rays," *Trans. of Ophth. Soc.*, Vol. XXIII., p. xi.

epithelial and other tissues ; and further, we have a means of producing an inflammation, varying from a very slight leucocytosis to an actual gangrene of the part, which, with due care and experience, we have under almost perfect control."

Dr. Bethemiox¹ in France treated three cases of trachoma with X-rays, and obtained results which he considered superior to those which follow other forms of treatment. Especially good were his results in cases where there was much pannus. He employed short exposures daily, or at least four or five times a week ; the distance of the anode being 10 to 25 cm. from the eye, with a current of 3 to 4 ampères and 16 volts. His results seemed better when the lids were everted than when the exposures were made without eversion. In a case of recurrent phlyctenular ophthalmia with ulcers of the cornea in a scrofulous little girl of five years of age, he obtained marked improvement from one-minute exposures to X-rays four or five times a week during a period of six weeks.

Mr. Sydney Stephenson² has recorded a case of tuberculosis of the conjunctiva cured by X-rays. The patient was a child, aged four years. Swelling of the eyelids and a discharge of "matter" had been noticed for two months. The upper and lower retro-tarsal folds were found to be bestrewn with miliary granulations, and folds of cock's-comb-like tissue. The sub-maxillary and pre-auricular glands on the same side were enlarged.

Microscopical examination of sections of the granulations showed a typical picture of tuberculosis, the giant - celled systems being especially well marked. A restricted number of tubercle-bacilli were found. Inoculation-experiments were undertaken with a positive result.

The affected conjunctiva was treated by exposure to the X-rays at a distance of 6 to 10 inches from the focus-tube for an average period of ten minutes at each sitting. Between December 2nd, 1902, and January 1st, 1903, nine such exposures were made, with the consequence that the local condition underwent a great improvement. On January 20th it was noted that the conjunctival malady was practically cured. On

¹ "X-rays in Ocular Therapeutics," *Recueil d'Ophthalmologie*, July, 1903, p. 406.

² "Tuberculosis of the Conjunctiva cured by X-rays," *British Med. Journal*, June 6, 1903, p. 1813.

April 3rd the conjunctiva appeared to be wholly free from disease, and the only cicatrices present were those produced by the removal, for diagnostic purposes, of diseased material.

PARAFFIN-INJECTIONS IN OPHTHALMOLOGY.

The introduction of the practice of injecting melted paraffin for the improvement of deformities of the nose has suggested to ophthalmic surgeons that similar injections might be made into the socket after enucleation of the eyeball, with the object of increasing the prominence and mobility of an artificial eye.

Hertel¹ tried a series of experiments on rabbits. He first injected sterilised paraffin with a melting-point of 40° C. into the healed socket after enucleation. Two rabbits died of embolism immediately after the injection was made; in the others, though very little reaction was set up, no satisfactory stump for an artificial eye was produced. He next introduced balls of paraffin with a melting-point of 78° C. into Tenon's capsule after enucleation, and into the sclerotic after evisceration (Mules' operation), and obtained very satisfactory results. He also tried injecting with a specially-contrived syringe, into the healed socket, paraffin with a melting-point of 60° C.; the results were better than those obtained from injection of paraffin with a lower melting-point, but not as good as those obtained from the insertion of the solid balls.

Examination of the orbital tissues, 12 to 15 months after the injections, showed that where the soft paraffin had been used it was irregularly distributed between the different layers of orbital tissue. There were also the remains of a variable amount of old inflammatory reaction and a fibrous capsule around the paraffin. Where the hard paraffin was employed it had spread less and formed a more compact mass. There seemed a tendency for the paraffin to become broken up and absorbed.

Rohmer² in 1901 reported some cases in which the mobility and position of the artificial eye were improved by injection of a cubic centimetre of warmed liquid vaseline into the tissues of the orbit two or three weeks after enucleation.

¹ "On Paraffin Prothesis in the Orbit," *Archiv für Ophthalm.*, LV., 2.

² *La Clinique Ophthalmologique*, February 25, 1901.

The injection of paraffin into the tissues has not only been known to produce embolism and death when employed experimentally on animals, but also when used remedially on patients. Head and Holden¹ of New York record a case in which the symptoms of embolism of the central artery followed injection of paraffin into the nose. Two injections were made without any ill effects. On the third occasion a mixture of paraffin and white vaseline was employed with a melting-point of 110° F. The needle was introduced first at the top of the nose, and pushed upwards an inch, then at the root and pushed downwards. At the time of the operation the patient was observed to rub his right eye, and then found he was quite blind in it. A little later ecchymosis appeared at the tip of the nose, indicating that a vein had been punctured. The eye was examined within half an hour of the onset of the blindness. The retina was hazy, the retinal veins normal in appearance. The main inferior branch of the central retinal artery and its divisions were empty and collapsed, and only to be recognised by the faint white outline of their walls. The main superior branch contained some blood, but when gentle pressure was made upon the eyeball, the blood-column in it broke up, and the blood flowed back to the central artery. In spite of treatment with nitrate of amyl, digitalis, and massage, no sight was regained. Later the typical oedema of the retina and the cherry-red spot at the macula appeared.

If in this case the paraffin was injected into one of the veins in the nose, it becomes exceedingly difficult to explain the course of the embolus before it became fixed in the central artery of the retina.

Mindful of the risks which attend injection of paraffin into the tissues, Dr. Maitland Ramsay² has tried injection of it into Tenon's capsule after the eyeball has been removed. In his last paper on this subject he mentions that he has performed the operation 42 times. His method of procedure as the result of his most recent experience is briefly as follows:—The conjunctiva is divided as close as possible to the corneal margin; each rectus muscle is caught up on a strabismus-hook, and a

¹ "Embolism of Central Retinal Artery following upon Injection of Paraffin into the Nose," *Medical Record*, July 11, 1903.

² "The Cosmetic Value of Paraffin Injections after Enucleation of the Eyeball," *Lancet*, January, 1903; *Ophthalmic Review*, July, 1903.

strand of catgut, knotted at one end, is passed through the tendon and overlying conjunctiva, the knot preventing it from slipping. The tendons of the recti muscles are cut at their insertion into the sclerotic, and thereafter the operation for the removal of the eyeball is completed in the ordinary manner. The capsule is opened to its utmost capacity by holding the recti muscles on the stretch by means of the four catgut sutures. It is then packed with gauze moistened with adrenalin, and a strong black silk purse-suture is passed round its mouth. This done, the gauze packing is removed, and if the whole interior surface be dry, the melted paraffin is injected. The paraffin used has a melting point of 104° F. A special syringe is employed, the nozzle of which is inserted into the capsule of Tenon, and the suture drawn tight round it. The sac is distended with the paraffin, the nozzle withdrawn, and the suture quickly pulled tighter still, so that none of the injected matter may escape. The ends of the silk thread are then securely fixed by a double knot, and the catgut sutures are tied, the superior rectus muscle being approximated to the inferior and the internal to the external. The paraffin is thus induced to mould itself in the socket, and to form a stump to which the divided muscles readily attach themselves.

In Dr. Ramsay's series of 34 cases the paraffin has three times come out. The tendency to its escape has been lessened, he thinks, since the introduction of the purse-suture. In one case sympathetic inflammation followed an enucleation and injection, but he does not think any blame was attributable to the paraffin. He is well satisfied with the cosmetic results of the operation. The advantage is not so much in the greater mobility of the prothesis as in the minimising of the flat, sunken appearance of the upper lid which nearly always follows simple enucleation.

Dr. George F. Saker¹ has injected paraffin into the cavity of the sclerotic after evisceration, and into Tenon's capsule after enucleation, both at the time of the operation and also a week later. The latter he thinks the better plan ; the wound, except at the small opening maintained for the insertion of the nozzle of the syringe, is then firmly healed, and there is

¹ "Paraffin : its Use in the Formation of a Stump after an Enucleation." *Annals of Ophthalmology*, January, 1903, Vol. XII., p. 51.

less chance of escape of the paraffin through it. Besides, all haemorrhage will have been checked, and the oedema and infiltration which ensue after the operation will have almost subsided. He thinks, however, that the greatest field of usefulness for paraffin-injection will be for the improvement of a sunken socket at some time remote from the enucleation. For this purpose, with a pair of forceps, he picks up the conjunctiva at the apex of the socket, and makes a small opening in it with a narrow scalpel. Around this opening he then forms a kind of pocket in the sub-conjunctival tissue, into which he injects about a drachm of prepared paraffin. Care must be taken not to over-distend the cavity. It is advisable to insert a suture for the closure of the wound before the injection, as it is difficult to introduce it later. A good deal of reaction follows the operation, but this can be controlled by cold applications. Generally the patient can insert the artificial shell a week or ten days afterwards.

Dr. Saker employs a mixture, with a melting point of 102° F., composed of three-fifths pure vaseline and two-fifths chemically-pure white paraffin. He says that excessive heat, as in exposure before a furnace or in high fevers, does not liquefy the paraffin when once injected into the socket. The vaseline which is incorporated with the paraffin becomes absorbed, so materially raising the melting-point. Pure paraffin has a higher melting-point than any temperature a patient may have under any circumstances.

Dr. Francis W. Alter¹ has inserted a solid ball of paraffin into the empty Tenon's capsule after enucleation of the eyeball, closing the wound over it by deep catgut sutures and a conjunctival silk purse-string suture. He claims that solid paraffin possesses the following advantages for insertion in this way:—

(1) It is non-irritating ; (2) it can be effectually sterilised ; (3) it is non-absorbable ; (4) while it is hard, it does not possess the degree of rigidity that glass or other similar substances exhibit, and hence it ultimately moulds itself to a nicety into the empty Tenon's capsule and thus, (5) what is most important, extrusion is less apt to occur.

¹ "Implantation of a Ball of Solid Paraffin to secure a Prominent Stump after Enucleation of the Eye," *The Ophthalmic Record*, Vol. XII., No. 3, p. 117. March, 1903.

RING-ABSCESS OF THE CORNEA.

In 1893 the writer¹ gave the following description based on the pathological examination of four cases of ring-infiltration or ring-abscess of the cornea, a condition to which previously but little attention has been paid. He described it as an affection following perforating septic wounds of the cornea, of either its central or peripheral portions. Whatsoever the locality of the wound, the ring of infiltration occupies precisely the same position, its outer edge being 1 mm. distant from the corneal margin. The ring forms very rapidly after the infliction of the wound : in one case it was all but complete in 24 hours. It is accompanied by pus in the anterior chamber. Microscopically the cell-accumulation between the laminæ of the cornea is seen to be densest at a position almost equidistant from its anterior and posterior surfaces, or slightly nearer the anterior. There are also sometimes collections of cells between Descemet's membrane and the corneal substance. The area of cornea contained in the ring is at first quite free from any infiltration ; later a general diffuse cell-increase throughout the whole cornea is observed.

Fuchs² has recently recorded the anatomical examination of nine fresh cases of this affection and has brought forward some most interesting observations and suggestions as to its mode of origin. He has found that the posterior layers of the cornea included within the ring, before they become infiltrated, are necrotic ; also that bacteria in large numbers are present in the exudate within the eye ; but that the infiltrated area of the cornea forming the ring is free from microorganisms. From this he infers that the cornea becomes infected by a toxine generated by microorganisms within the eye ; this diffuses into the posterior layers of the cornea rendering them necrotic, and the leucocytic invasion occurs at the periphery. The anterior zone of infiltration, which is always the most intense, proceeds from the vessels of the limbus and the anterior ciliary vessels. The posterior zone of infiltration just in front of Descemet's membrane is probably due to invasion through that membrane from the anterior chamber.

¹ Treacher Collins : "Observations on Ring-Infiltration of the Cornea," *Ophthalmic Review*, Vol. XII., 1893.

² "Ring-Abscess of the Cornea," *Archiv für Ophthalmol.*, Vol. LVI., Pt. 1.

Fuchs draws an interesting comparison between this ring-abscess of the cornea, due to poison generated within the eye and passing forwards into the cornea from behind, and serpiginous ulcer of the cornea, in which poison generated in its superficial layers passes backwards into the interior of the eye. The points of difference will be best brought out if they are presented in parallel columns.

<i>Serpiginous ulcer.</i>	<i>Ring-abscess.</i>
Develops from a superficial injury.	Develops from a perforating wound or without injury.
Commences around the point of injury.	Independent of position of injury.
Extends from seat of injury to periphery of cornea.	Extends from periphery to the middle of cornea.
Exceptionally leads to panophthalmitis.	Nearly always goes on to panophthalmitis.
Infiltration of borders of wound.	No infiltration of borders of wound.
Wedge-shaped area of infiltration directed to the corneal margin.	Wedge-shaped area of infiltration directed to the middle of cornea.
The wedge-shaped infiltrate is the chief seat of bacteria.	Ring of infiltration contains no bacteria.
Necrosis of the deeper parts of the cornea proceeding from the surface.	Necrosis of the cornea proceeding from the deeper layers outwards.
Exudate in anterior chamber free of germs.	Exudate in anterior chamber rich in bacteria.
Usual organism, the pneumococcus.	Usual organism, various bacteria.

Hanke¹ has found a bacillus in a case of ring-abscess of the cornea, in a man aged 44, which he was able to cultivate.

He implanted some of the fresh cultures into the substance of the cornea and into the aqueous chamber in rabbits and guinea-pigs and produced a zone of infiltration 1 mm. from the limbus in the parenchyma of the cornea, together with hypopyon, panophthalmitis and phthisis bulbi subsequently ensuing.

¹ "An Undescribed Bacillus as a cause of Typical Ring-Abscess of the Cornea," *Zeitschr. für Augenheilkunde*, November, 1903.

He describes the bacilli at considerable length ; briefly, they consisted of long thinnish rods with rounded ends, staining with aniline dyes, but not with Gram's method. They grew luxuriantly upon agar, glycerine-agar, serum-agar, and maltose-agar as delicate translucent colonies, with a deep-green fluorescence around them, which soon spread throughout the media. This fluorescence was best seen in old cultures and in those made in maltose-agar.

The case from which he obtained this bacillus, unlike most recorded cases of ring-abscess, does not seem to have had a perforating wound. The eye was injured by a splash of hot machine-oil, and a fortnight later a yellowish-grey ring, 2-3 mm. wide and 3 mm. from the limbus, was discovered. Unlike Fuchs' cases bacilli were found, not only in the hypopyon, but also in scrapings from the corneal ulcer.

SPRING CATARRH.

Some two and a half years ago the writer saw a gentleman who had consulted ten well-known oculists with reference to his eyes ; five told him he had trachoma and the other five that he had spring catarrh. This shows how difficult it may be sometimes to diagnose clinically between these two affections. The histological appearances of affected tissue in the two diseases are, however, quite distinct. In trachoma there would certainly be nodules of lymphoid tissue present, whilst in spring catarrh there would be enlarged flat-topped papillæ composed of dense fibrous tissue and no lymphoid follicles.

The recent researches of Major Herbert,¹ I.M.S., would seem to afford a fresh method of identifying spring catarrh, either by histological examination of a portion of the affected tissue, or by the much simpler method of examining a cover-glass preparation made from the exudation. Major Herbert's paper is entitled "A Preliminary Note on the Pathology and Diagnosis of Spring Catarrh," and deals only with cases observed by him in natives of India. After perusal of it we shall certainly look forward to the fuller account of his more extended researches which the title of his paper implies as

¹ "Preliminary Note on the Pathology and Diagnosis of Spring Catarrh," *The Ophthalmoscope*, November, 1903, Vol. I., p. 176.

forthcoming, and which we hope will be adequately illustrated. He finds that in this affection both the ocular and the palpebral conjunctiva is involved, and is remarkably infiltrated with eosinophile leucocytes. Such an infiltration appears to be a very rare occurrence in any part of the body. He only knows it to have been observed in some cases of pemphigus of the skin.

The infiltration is very marked only in the more irritable stages of the affection. The cells lie especially near the free surface of the elevations, in the epithelial layer as well as below it. They are more uniformly diffused in the palpebral papillæ than in the limbus-thickenings, where they tend to be collected mainly about certain points. Even in palpebral tissues this tendency to localisation is seen to a small extent ; the epithelium is thinned at the most infiltrated parts, and here the wandering cells, mostly eosinophile, are passing through in large numbers to the surface. In the ocular swellings the shedding of epithelium and its infiltration with eosinophiles may reach a stage further, so that actual breaches in the epithelium are produced, in and upon which the cells which are pouring out may be seen heaped up. There is ordinarily very little exudation in cases of spring catarrh, but Major Herbert finds that it may be quickly induced by slight irritation of the surface. The mere exposure, he says, of the upper tarsal conjunctiva necessary for a very complete examination may quickly produce a thin layer of mucoid or membranous exudate on the surface, and this freshly-induced exudate is best suited for microscopical smear-preparations, owing to the fact that the eosinophile cells very quickly break up. In ordinary inflammatory exudation eosinophiles are extremely few, so that the presence of them in any number would afford an important factor in the diagnosis of spring catarrh.

Major Herbert further examined the blood in six cases of spring catarrh and found an increase of eosinophiles to form 10 to 20 per cent. of the total leucocyte-count. This in itself is a common occurrence in natives of India, due to the harbouring of nematode parasites in the intestines or elsewhere. But occurring along with the presence of the eosinophiles in the conjunctiva, it must be taken into account in considering the pathology of spring catarrh.

Dr. W. Campbell Posey,¹ of Philadelphia, sent a circular letter to the ophthalmologists throughout the United States, with a view to ascertaining their experiences with reference to spring catarrh. Their answers showed that it occurred in the proportion of about one to every 200 to 300 cases of conjunctival disease, and that it is not increasing in frequency. The palpebral type is the most common (60 per cent.), the associated form next (30 per cent.), and the ocular form least common (10 per cent.). The elevations in the conjunctiva are more common than the thickening of the conjunctiva; both lids are as a rule affected. In about 7 per cent. of cases the disease was limited to one eye. The age-limits are from 18 months to 50 years; males are more frequently affected than females, 85 per cent. as compared to 15 per cent. It is questionable whether there is any connection between vernal conjunctivitis and diseases of the nose and throat; it is not considered contagious; it may sometimes be hereditary.

With regard to treatment of the affection Dr. Posey says nearly everything in the ophthalmic *materia medica* has been tried, as well as operative procedures, but weak astringent washes with occasional massage with yellow oxide of mercury ointment give the best results. Adrenalin is found to relieve the intense itching, and iced compresses and lotions are also useful.

¹ "Vernal Conjunctivitis," *Journal of American Medical Association*, July 25, 1903.



Public Health.

THE HEALTH-FACTOR IN EDUCATION.¹

By F. G. BUSHNELL, M.D., B.S., D.P.H.,

Pathologist to the South Devon and East Cornwall Hospital, &c.

MR. PRESIDENT AND GENTLEMEN,

As medical men we can appreciate at its true value the importance of a knowledge of the principles which govern health and disease, without ourselves being trained in the art and science of teaching. Sir John Simon's ideal education would "by model and example lead the poorer classes of society to know cleanliness from dirt and would apply their instincts of self-preservation to the deliberate avoidance of disease." Charles Kingsley believed that "teaching of this kind ought to and will be held a necessary element in the school course of every child, just as necessary as reading, writing, and arithmetic." To this most of us would say, "Yes, and even more necessary."

As you know, the medical journals and *The Times* have opened their columns to the question of physical deterioration. This should undoubtedly be tested by systematic anthropometric and physiological observation, but at the same time we must not ignore the obvious evils, largely remediable, of which we, as medical men, are fully aware. I refer, of course, especially to the preventable diseases (so called) as given in the yearly report of the Registrar-General. As on a former occasion, and as I hope to do again, I propose to treat the subject from the national point of view or that of the elementary schools.

Several problems at once suggest themselves to our minds :—

(1) "What are the opportunities afforded in elementary schools for instruction in practical hygiene?"

(2) "What powers exist, if any, to supervise, medically or

¹ An Address delivered before the S.W. Branch of the British Medical Association, January, 1904.

otherwise, the health of the scholars and the conditions under which their school life is spent ? ”

(3) “ What training and inducements are there for teachers to learn and to impart such knowledge as we desire ? ”

(4) “ What practical recommendations can be made ? ”

I omit a comparative study of the subject from the usages of other countries from the list of queries until I have more information available than at present.

I am sure that I shall have your sympathy in treating the subject on broad lines, for is there not “ in the air ” a growing warmth of interest in public affairs, local as well as Imperial ?

Question 1, as to the opportunities afforded in elementary schools for teaching hygiene, is answered, briefly, as follows :— In 1900 the “ Block Grant ” system to such schools was introduced into the annual code of the Board of Education. All schools must take certain subjects, including “ Lessons on Common Things,” with a list of additional subjects, one or more of which must be taken when H.M.’s Inspector thinks it desirable. In this list are hygiene, animal physiology, domestic economy, elementary physics, and chemistry. Besides this, special grants are paid for cookery, laundry-work, dairy-work, and household management. The instruction in all subjects is to be in accordance with a syllabus, which must be produced to the Inspector at his visit. Under article 16, any other subject may be introduced if approved by the Inspector. In 1899, of five and a half millions of boys, girls, and infants on the rolls, 2 per cent. were taking domestic economy (mainly girls), and 1 per cent., mainly boys, animal physiology. This shows the ample opportunities that exist, and the slight advantage that is taken of instruction in hygiene. However, the Leicester School Board and the Bradford School Board have carried out with success a scheme of hygienic teaching, and some action also has been taken in the West of England. Leeds, too, has moved in this direction, but much more general adoption of instruction is needed.

The second question I submit is, “ What powers exist to supervise and improve the health of scholars and the conditions under which their school life is spent ? ” The Department of Education has confined itself in its codes mainly to regulations intended

to ensure the physical well-being of children ; it has drawn up building-rules ; it has made restrictions to exclude children or to close schools during epidemics. The Local Government Board issues a memorandum on Epidemic Sickness ; this and the code of rules of the Medical Officers of Schools' Association should be familiar to all teachers. It has issued a model course of physical training, and such training has been definitely approved by the Prime Minister as a part of secular education. Separate schools for children of imperfect intellect have been provided and special grants are paid towards their maintenance. An important step in advance is the appointment in some places of medical officers to the schools which are under public education authorities. Excellent results are anticipated, for example, in London from the programme of instruction in hygiene in hand, inaugurated by the medical officer, Dr. Kerr. The weights and measurements of children, the supply of adequate food, cleanliness of person, soundness of teeth, freedom from disease of the nose, ears, eyes, throat, skin, &c., can thus be observed and dealt with systematically. Such statistics of anthropometrics and physiology would be an invaluable record to aid the nation and the Royal Commission to determine the reality of the supposed tendency to physical deterioration.

The third question, As to what inducements are held out to teachers to train themselves and to impart to children such knowledge as we advocate next presents itself. It is self-evident that, granted even the full approval of the Education authority, it is indispensable that the lecturer be animated by absolute conviction of the truth and relative worth of such knowledge which, as the late Mr. Herbert Spencer truly said, is the momentous question in deciding on a code of education. Teachers are regarded as fully qualified after passing the "certificate" examination, either as "acting" teachers or after residence or attendance at a training college. The syllabus for the 1903 examination for "acting" teachers (who continue their work in schools while reading for their examinations) included under "school method" certain points, in school hygiene, of the utmost importance. However, no knowledge of the elements of animal physiology is asked for. Training colleges have the power of drawing up their own schemes of study, and undoubtedly should insist on similar instruction

in their curriculum. This may be given in the evening continuation-classes under "Knowledge of Common Things," and "Life and Duties of a Citizen." In this respect, I may say, that in 1902 a Committee of the British Association appointed to report "on the conditions of health essential to the carrying on of the work of instruction in schools" advised that the Education Department should (1) adopt or recognise some more thorough and practical test of a teacher's knowledge and experience of the application of health-conditions in school-life; and (2) should further protect health in school-life by making practical knowledge of hygiene as applied to school-life an essential qualification for those to whom it entrusts *school inspection*.

Finally, we should determine what we as medical men consider as all important for embodiment in our national systems of education. I would bring to your notice the health-conditions, relating to school-life, which appeared imperative to the British Association in 1902, were:—

- (1) Bodily nourishment;
- (2) Clothing;
- (3) Housing of children in schools;
- (4) The working of the bodily functions and organs of sense;
- (5) Physical exercise;
- (6) The appointment of time to work and rest, including length of lessons and holidays;
- (7) Healthy tone of mind and morals; and
- (8) Preventive and precautionary measures against infectious diseases.

I believe, too, that the eleven recommendations of the Royal Commissioners, appointed in 1902 to inquire into and recommend upon physical training (Scotland) are worth your close attention.¹ They gave recommendations upon the health-methods to be adopted for improvement in schools, universities, and continuation-classes for feeble-minded and cripples. Sound advice was given on medical and general "inspection," on feeding, system in teaching, training of teachers, and the value of auxiliary agencies (boys' brigades, &c.).

¹ Summarised in the *British Medical Journal*, April 4, 1903.

The views, also, of Miss Alice Ravenhill as expressed at the Sanitary Institute are well worthy of your notice. Miss Ravenhill recommends that systematic practical lessons on hygiene should be continuously given in the seven standards in elementary schools to be characterised by *simplicity* of treatment and a natural development from certain essential principles, and to be suited for both sexes. In Standard I. the attention should be directed year by year to the essentials of a healthy, happy home ; its comforts and conveniences, such as light, air, space, cleanliness, surroundings, repairs, rent, and fittings. Some outline of the protection afforded to all by the Public Health Laws is to be given in Standards VI. and VII.

"Dirt-dangers" in the person, home, and community are selected for subject II., cleanliness and comfort for subject III., air, food, and water, subject IV., with hints on rest, work, and play. The series is concluded by lessons on the care of the person and preservation of health of the person and of the community. An outline scheme for teaching through the seven standards, and specimen lessons, are appended to this excellent paper, the lessons of which are practical and conversational in method, and possess truly educational, as apart from disciplinary, features.

Such experience as I have gathered personally leads me to emphasise in summary, as follows :—

(1) *The vital need for close attention to the hygiene of school-rooms and school-life.* I would ask, for instance, how any teaching in hygiene can appeal to the healthy instincts of childhood when they are allowed to breathe daily a polluted atmosphere. Children are impressionable, and any such teaching becomes worse than useless ; it makes hygiene a sham and object of ridicule when they are made to break the laws they are learning. After all, ventilation is largely a matter of opening the windows, and classes, when possible, should be held in the open air. The herding together of those engaged in brain-work in a foul atmosphere, combined with inadequate nourishment and the presence of infection, are the potent causes of tuberculosis. Let us note that the school authorities in Paris recognise this in the fight against tuberculosis, and send their children from the 11th Ward, between the ages of 10 and 13 years, to a country house, where 3,000 children obtain

a three weeks' "course" of open air and good food yearly in the Vosges Mountains, in batches of 200.

Hygiene in the school-room and adequate nourishment is called for and should be supplemented by open-air classes, "nature studies," and visits to the country.

(2) The Board of Education, H.M. Inspectors, and Education authorities should see that the *elementary principles of health* indicated previously are *universally taught*, and that *physical exercises* are carried out.

(3) All such hygienic arrangements should be supervised by *medical officers* with special knowledge and authority, so closely are these problems dependent on medicine to my mind.

(4) *Teachers* should be required to show clear knowledge and deep conviction of health-principles, and the laws governing the spread of infective diseases *before receiving their certificates*.

(5) The national conscience should be aroused to the need for safeguarding ourselves against disease by the formation of a *Ministry of Public Health* and organised service in counties and districts. The *Imperial Health Manual*, issued by the Imperial Health Department of Germany, stated that the expenses occasioned by sickness in Germany in 1891 were not rated too high at £25,000,000. We may assume that similar losses in £ s. d. are occurring in this country, and equal ravages in the vigour, energy, intellectual capacity, and happiness of the race.

I express my deep acknowledgments to the reports of the bodies I have mentioned, to the Sanitary Institute, to Miss A. Ravenhill's papers, and to Mr. C. W. Bracher, B.A., Principal, Pupil Teachers' Centre, Plymouth, for much information, and to you, Mr. President and gentlemen, for your kind attention.

Our Rising Generation.

IN these days when so great a part of the whole population is crowded together in towns, without access to fresh air and sunshine, the problem presented by the question of breeding a race of strong and vigorous citizens for the State becomes a matter of extreme importance. We need no Royal Commissions to bring home to us the degeneracy of many of the children of the poor who inhabit the sunless and airless slums of our great cities. The succession of rickety children who are brought daily to the out-patient department of any hospital is proof enough of the unsatisfactory state of things which prevails. But what is to be done to remedy the ill? It is useless to point to the law of evolution, which ensures the elimination of the unfit in the struggle for existence. Of the reality of the law there is no doubt; but may it not be that if we allow too great a proportion of the unfit to exist in our country, the mode adopted by nature will be the unpleasant one of eliminating us as a people of importance in the world altogether, and handing on the torch of civilisation to some hardier and more virile race? Such seems to have been her mode of action in the case of the Roman empire, which was deposed from its preëminence by hordes of barbarians from the North. Are we prepared to suffer this mode of natural selection in our turn, or are we to make some effort to remedy the defects which admittedly exist in the physique of our race, while there is time? It is, however, easy to point to the evil, and very hard to see clearly the remedy which is to prove effectual. We commend to those who are interested in this problem the volume of collected essays which Mr. H. G. Wells has recently issued under the title of *Mankind in the Making*. Among much which is political and therefore unsuited to discussion in a medical journal, there is also much which concerns us as members of the medical profession, and which affords food for reflection, in the direction of public health and private conduct,

Mr. Wells rightly points out that the future of the state depends on the race of citizens whom we are now producing, and we may well ask, "Is it well with the child?" in connection with many of our rising generation. How are we to arrange that every future citizen, from birth up, shall have a decent chance of securing a home fit to ensure to him healthy and beneficial surroundings—fresh air, good food, adequate clothing, to say nothing here of moral influences? We are far at present from securing such an environment in the case of thousands of our fellow countrymen. In what direction does the best hope of improvement lie?

* * * * *

A **VERY** interesting experiment has recently been made by certain philanthropic individuals, with a view to providing an answer to

Garden Cities. the question, how town life, which seems a necessity of our existing social condition, may be combined with the advantages of the country. It is proposed in the Garden City, which is being planned on a site provided by the liberality of Mr. Cadbury, to lay out a city or village on intelligent lines, instead of letting a town grow up haphazard according to the private interests of the landlord and the jerry-builder. Each cottage is to have its plot of garden around it, and the streets are to be scientifically laid out. A factory is to be set up here instead of in some existing town, and the inhabitants of the model city are to be employed in this as a means of earning their living, without the evils usually associated with factory life. It is intended that the new venture shall pay its way, and shall not be a charitable institution. We wish it all possible success, and should rejoice to find that the idea underlying it is capable of practical application. It is perhaps too much to hope that our existing towns will be remodelled on such a plan; but if anything can be done to prevent further spread of the evils of modern town life, a distinct step forward will have been taken.

* * * * *

The Breeding of Human Beings. MR. WELLS, in the book which we have quoted, points out that the problem of breeding human beings on scientific lines is not at all a simple one. We are not sure in our own minds what

points we are to endeavour to produce and what to eliminate. Even in the case of definite diseases, it is difficult to fix on certain conditions and to say that those who are the subjects of them are not to be allowed to procreate their species. How often in those who have some physical weakness do we find moral qualities which we should wish to perpetuate! We cannot settle off-hand what weight we are to give to bodily, and what to mental qualities. Those who are inclined to think that it would be easy to make definite rules forbidding marriage even in well-marked cases of ill-health are recommended to read Mr. Wells's book. They will there find some of the inherent difficulties set forth.

* * * * *

Hygiene in
Elementary
Schools.

THE question of the teaching of the elements of hygiene in our National Schools has been brought into some prominence lately, and the facilities at present existing for this purpose are set forth by Dr. Bushnell on another page. It is undoubtedly desirable that children should have opportunities of learning something about the proper means of keeping healthy, and it is only too evident that among the poorer classes at the present time there exists not the smallest approach to knowledge on such matters. Fresh air is difficult to obtain at any time in our large towns, but even that amount which is obtainable is not often found in the homes of the poor, or indeed of many among those middle classes who belong to higher social strata. Knowledge permeates slowly downwards, and the ideas as to treating disease which were almost universal among our ancestors, comprising a total exclusion of "draughts" and insistence on a superfluity of bedclothes, are still too prevalent among many who might be expected to have learnt better. Too often, again, the elementary rules of personal cleanliness are disregarded, if not unknown. It is only by teaching the children who form the rising generation that we can hope to spread the light upon these subjects, for it is difficult, if not impossible, to reach the parents. Any reasonable scheme, therefore, for teaching the rules of health in our schools must be welcomed. Needless to say the teaching must be of the simplest character, and the instruction of the teachers

themselves will be the first problem to be solved. But other countries have set us an example in the matter, and we must endeavour to make up lee-way in this respect.

* * * * *

The Diagnosis of Enteric Fever. WE owe to our readers, and to Dr. Ker, the writer of the article which appears on another page, our sincere apologies for the oversight which resulted in the omission of this important paper from our special number (January) on Enteric Fever. At the same time we are grateful for the assurances which we have received on all sides that our attempt to focus existing views on the subject of this disease has been appreciated by a large circle of readers. There are few diseases which in their early stages present greater difficulties of diagnosis, or in which it is more important to arrive at a just conclusion. A careful study of the symptoms and mode of onset will often admit of a fair degree of certainty being reached, especially if there have been other cases of the disease in the same house or neighbourhood. But in many instances we have to place considerable reliance upon bacteriological evidence. This may be of two kinds ; either the bacilli which causes the disease may be actually isolated from the blood or excretions of the patient, or the agglutination-test, called after Widal, may be employed. We referred in our January number to the limitations and fallacies of this test. It is unwise to put entire faith either in the clinical phenomena alone or in the report of the bacteriologist ; taken together they will lead us to a fair degree of certainty.

* * * * *

Antityphoid Inoculation. IN our present number Dr. A. E. Wright concludes his series of articles upon the subject of protective inoculation against enteric fever. The table of statistics which accompanies the present article tells very conclusively in favour of the use of the inoculation-method in the case of this disease, the death-rate being distinctly lower in the inoculated than in the uninoculated in almost every instance. It cannot be concealed that there are grave drawbacks to the method of vaccination in the severity of the symptoms which are induced by the

procedure, and these objections will no doubt be sufficient to act as deterrents to many who would otherwise avail themselves of the protection afforded. It seems that the Medical Advisory Board which presides over army medical affairs is not favourably disposed towards a continuance of inoculation among our troops. In face of the evidence presented by Dr. Wright we do not think that it would be justifiable to do away altogether with facilities, for those who are so disposed, to obtain the benefits of vaccination against enteric fever. On the other hand, it would be still less justifiable to make the inoculation universally compulsory, as is the Jennerian vaccination against small-pox. The two diseases are not similar in nature. Small-pox as a rule protects those who have once suffered from it against a second attack, whereas two attacks of enteric fever are not by any means unusual. Vaccination cannot in either case do more than actual infection ; hence we could not in any case expect as great a degree of protection from antityphoid inoculation as from vaccination proper. But the evidence is in favour of its ability to afford some protection against the disease, if not to prevent it altogether ; and we should be inclined to advise those who are likely to be brought into contact with the infection to submit to the temporary inconveniences of the inoculation, which in any case cannot do serious harm, and which may result in actually saving them from a fatal attack of enteric.

* * * * *

WE notice in the February number of the
British Journal of Obstetrics and Gynaecology of the British Empire that this excellent journal has now changed its Editor ; Mr. Alban Doran, who has so ably piloted it through the first two years of its life, being succeeded by Dr. T. W. Eden, who has hitherto acted as Secretary to the Editorial Committee. The success which this journal has attained in the past affords sufficient evidence that it was needed as a rallying-point for British workers in the gynaecological field. We are glad to have a visible proof of the amount of good work which is being done in this country, in the shape of the very interesting and important articles which have so far appeared. We are confident that the new Editor will worthily

carry on the work so well begun, and hope that all who are interested in this branch of medicine will support him in the undertaking.

* * * * *

New Method of
Microscopy.

An account is given in a recent number of the *Münchener Medicinische Wochenschrift* (January 12, 1904, page 58) of the new method of illumination applied to objects beneath the microscope, which is said to make visible minute objects which have hitherto been ultra-microscopical. The principle underlying the procedure is the fact illustrated by the motes which dance in a sunbeam, viz., that strong light reflected from the surface of a small object increases its visibility to a remarkable extent. In the new microscopic method small objects, such as bacteria, are suspended in a clear fluid in the field of the microscope, and a beam of concentrated light is thrown upon them in a direction at right angles with the axis of the microscope. They are thus seen by reflected light and magnified at the same time, and it is hoped that by this means some of the pathogenic agents which have so far remained unidentified may be at last rendered visible. The method is not adapted to the examination of sections of tissues, so that it cannot be expected to solve further problems as to the minute structure of the cell.

—♦—

Novelties and Notices.

KUTNOW'S EFFERVESCENT CARLSBAD POWDER.

This preparation is a white powder containing the ingredients of the natural Carlsbad springs. It effervesces on being added to water, and possesses a pleasant taste somewhat resembling the sherbet of our boyhood's days. It forms a very pleasant form of laxative medicine, acting, if taken in hot water before breakfast on an empty stomach, in the space of about one hour. In these days of constipation—due, as is said, to civilisation and over-refinement of food—it is useful to know of an aperient remedy which is not nauseous to take. Kutnow's powder will be found most useful by sufferers from haemorrhoids, as it is gentle in its effects, while relieving the loaded portal system by its hydragogue action. The advantage of such a course of saline aperient medicine is often strikingly apparent in the increased sense of well-being which follows the flushing of the excretory channels and the ensuing clearance of noxious waste products.

BRAND'S ALBUMINOUS ESSENCE OF BEEF.

This essence resembles in appearance a concentrated gravy from good beef, and forms with boiling water a beverage similar to home-made beef-tea. It contains not only the extractives which form the chief constituents of many meat-extracts, but also a considerable quantity of albuminous material, so that it is not a mere stimulant, but possesses a considerable value as a food. It should form a useful addition to our invalid dietary. It is sold in hermetically-sealed tins, and should keep indefinitely before being opened.

BRAND'S BEEF-TEA TABULES.

These are small oblong tablets, somewhat resembling in size and in their silver-paper wrappings the well-known cakes of butterscotch. Each tabule is adapted to make a cupful of beef-tea when dissolved in boiling water. They form a convenient and portable preparation for this purpose.



Reviews of Books.

The Operations of Surgery. By W. H. A. JACOBSON, M.Ch. Oxon., F.R.C.S., Surgeon to Guy's Hospital, and F. J. STEWARD, M.S. Lond., F.R.C.S., Assistant Surgeon to Guy's Hospital and to the Hospital for Sick Children, Great Ormond Street. Fourth Edition. London: J. and A. Churchill. In two volumes. 1,503 pages. 550 illustrations. Price £2. 2s.

IN our review of the last edition of Mr. Jacobson's work on Operative Surgery (THE PRACTITIONER, May, 1897) we expressed the opinion that, although British surgery was not fairly represented therein, yet the work was too valuable to be permitted to fall behindhand and become antiquated without a protest. In the present edition many alterations have been made which render it much more up to date, though it may be doubted whether the changes have been sufficiently radical. The work has been divided into two volumes, a most desirable alteration, and over 150 pages have been added, whilst each page contains a larger amount of print, so that much additional matter is present. The same excellent division of the letterpress into larger and smaller type is retained. The greater part of the work has been done by Mr. Steward, but Mr. Jacobson is wholly responsible for the first six or seven hundred pages, and has overlooked the remainder, whilst he also is responsible for all the new illustrations. The chapters dealing with operations on the Ovary and Uterus have been rewritten by Mr. G. Bellingham Smith, Obstetric Tutor and Registrar at Guy's, in succession to Dr. Dakin, who did this in the third edition.

There can be no question that the work has been immensely improved by this latest revision. Modern methods are generally well represented, and many of the sections in which most advance has been made are dealt with much more elaborately. In particular we note those dealing with the Surgery of Tendons, with Traumatic Epilepsy, and with Suppurative

Diseases of the Ear (in connection with which Ballance's illustrations are introduced, and suitable references made to Macewen's "Pyogenic Diseases of the Brain and Spinal Cord"). The sections on bullet-wounds and the use of Röntgen rays, and on Diseases of the Frontal Sinus, are practically re-written, whilst those on Cerebral Tumours and methods of Cranial Surgery generally are much elaborated.

In spite of these many improvements, however, there are still things which would have been better left unsaid, or at any rate considerably modified. A good deal of antiquated material still remains, which needs excision, and a more radical and thorough removal of much that is old would vastly improve the book. Thus on page 81, Vol. I., we read of "pulpy disease of the elbow" in a patient "where there is no sign of tubercular disease," whilst in discussing the conditions for excision no reference to the inadvisability of totally removing epiphyses is made. Figs. 146 and 147 are wrongly described as characteristic of Nélaton's operation for Harelip, although rightly ascribed to Mirault in the letterpress—a mistake which also occurred in the last edition. Primary wiring of the olecranon is recognised as justifiable, but only in a sentence at the end of the section dealing with united fractures of that process. The operative treatment of fractures is everywhere very poorly referred to in this work, and evidently Mr. Jacobson does not approve of the energy displayed in this direction by his colleague, Mr. Arbuthnot Lane. The only notice of the procedure as applied to simple fractures of long bones is contained in two pages at the end of the second volume. We are also told that the operative treatment of fractures of the patella has "dropped somewhat out of notice," and this is attributed to the fact that non-operative treatment is now so much more successful that the former is not required. The reviewer would be inclined to attribute it to the fact that it is so generally undertaken that it is unnecessary to call much attention to it. There still remains in this section that, to us, terrible piece of advice, to which we called attention in the last edition—viz., that if the fragments in an old-standing fracture cannot be readily approximated, then excision of the joint should be at once performed. The sections dealing with abdominal surgery are excellent, although there is even here a

tendency to put in too much in the shape either of antiquated, or of non-proven methods of intestinal anastomosis. Surely it is useless to take up space in describing procedures, of which the authors are forced to admit that they do not know whether they have yet been applied to the human subject.

On the whole, however, this work may be looked on as a judicious guide to students working for their higher examinations, and for the younger surgeons. A little more thorough expurgation of antiquities is desirable, and here and there absolute mistakes still need correcting, but the advice as to the pros. and cons. of operative justifiability are good, and the methods usually suggested are satisfactory.

The Errors of Accommodation and Refraction of the Eye and their Treatment. A Handbook for Students. By ERNEST CLARKE, F.R.C.S. Eng., M.D., B.S. Lond. ; Surgeon to the Central London Ophthalmic Hospital ; Ophthalmic Surgeon to the Miller Hospital. Crown 8vo. 84 illustrations and 1 coloured plate. London : Baillière, Tindall and Cox. Price 5s.

BOOKS on the subject of refraction of the eye do not now afford much scope for originality of treatment. They all follow much the same general lines. Having first explained a few elementary facts in optics, they proceed to describe the optical mechanism of the normal eye. Chapters then follow on Hypermetropia, Myopia, and Astigmatism, stating how they may be recognised and corrected by glasses. Anomalies of the ocular muscles are dealt with ; and finally there is nearly always a series of illustrative cases. The book before us follows these normal lines, its chief distinctive feature being the amount of space which is devoted to the subject of asthenopia. This the author defines as "eye strain," or "a symptom, or group of symptoms, the result of straining some part of the eye apparatus." We think, however, that it tends to confusion to include under retinal asthenopia such affections as "sun-blindness," "snow-blindness," "ophthalmia electrica," "erythropsia," and "night-blindness," which, though they are all the result of exposure to excessive light, are something more than mere fatigue, and have each distinctive features. A

chapter at the end of the book, which will be found of considerable use, gives the regulations as to the vision required by candidates for the different public services. It is throughout a thoroughly practical book, and can be recommended to students requiring a reliable guide to this most important branch of ophthalmic work.

Golden Rules of Refraction. By ERNEST E. MADDOX, M.D., F.R.C.S. Edin.; Ophthalmic Surgeon, Royal Victoria Hospital, Bournemouth. Bristol: John Wright and Co. London: Simpkin, Marshall, Hamilton, Kent and Co. Price 1s.

DR. MADDOX says that this book is to be regarded as a little miniature of a subject to which only a large volume could do justice. To paint a miniature requires as much skill as to cover a large canvas; and similarly, to compress into a small book, capable of being carried in the waistcoat pocket, a clear and comprehensive account of a subject on which large volumes have been written, is no mean accomplishment. The amount of useful information which is to be found here condensed into 86 small pages is astonishing. No student can now complain that the subject of refraction is one which it takes too long to read up. The whole book can be read from cover to cover in two hours. In a hospital journal some years ago a sarcastic student inserted an examination-paper in which one of the questions was, "Write all you learnt in the eye-department on the back of your visiting card." A text-book which taught him to condense his knowledge into a few words, as this one does, would be invaluable for such a performance.

The Practical Details of Cataract Extraction. By H. HERBERT, F.R.C.S. Eng., Major I.M.S., Professor of Ophthalmic Medicine and Surgery, Grant Medical College; In charge of the Sir Cowasjee Jehangir Ophthalmic Hospital, Bombay, &c. London: Baillière, Tindall & Cox. Crown 8vo. Price 4s.

ALL those who have had experience of operations for removal of cataract will agree that the success of the procedure is largely influenced by attention to a number of small details. This little

book of 109 pages consists of a discussion of these details, founded upon an experience of between two and three thousand cataract-operations performed in Bombay. The author, after having very accurately defined the limitations of the term "cataract," gives a brief account of the different varieties and of their course, only going so far into the matter as he considers necessary in connection with treatment. In the operation of extraction of cataract he favours an upward section, raising a flap consisting of rather less than half the cornea, encroaching very slightly on the sclerotic (.5 millimeter) all around, and including a conjunctival flap three or four millimeters deep at its summit. The tedious division of the operation by the performance of a preliminary iridectomy he considers quite unnecessary, but the arguments both for and against the performance of the latter are given in a very full and impartial manner. With regard to the use of forceps for the opening and removal of a portion of the lens-capsule, Major Herbert says he has had no experience. He states the advantages that are claimed for the practice, but seems to have a rather unnecessary dread of dislocation of the lens by their use. Further he speaks of lens-matter as though the mere contact of it with the iris was sufficient to excite inflammation in that membrane, notwithstanding that after discussion-operations the whole anterior chamber is often full of lens-substance, without the least sign of inflammation or undue redness. It seems probable that it is what grows in the lens-substance rather than the lens-substance itself which is the cause of inflammation and trouble. Any ophthalmic surgeon will gain some useful hints from the perusal of this book, whilst those who are beginning to operate will learn much which will serve to guard them from undesirable complications.

Lehrbuch der Allgemeine Pathologie und Therapie innerer Krankheiten (Text-book of General Medical Pathology and Therapeutics). Von Professor Dr. ADOLPH SCHMIDT, Oberarzt am Stadtkrankenhaus zu Dresden. Pp. 470. Berlin : August Hirschwald.

IN this work Professor Schmidt endeavours to do for Medicine what Billroth did for Surgery in his well-known lectures on Pathology and Therapeutics. We cannot wish to award higher

praise to the book before us than to say that the author has succeeded in this attempt. On first entering on the practical work of medicine in the wards of a hospital the student often finds the need of some assistance in gaining a general grasp of the principles on which the treatment of patients and the study of their symptoms are based. Without such aid the beginner finds himself bewildered and helpless. We know of no book in our own language which is so well calculated to assist him under these circumstances as that which Professor Schmidt has written for his needs. It starts with a consideration of the causes which produce disease—heredity, infection, intoxication, &c.—gives general advice as to methods of diagnosis and prognosis, and then sets forth the principles of treatment—the means by which we can modify the conditions called disease. Then the diseases of the separate systems are taken in turn, and their ætiology, pathology, and treatment are considered more in detail. The book does not profess to be a systematic treatise on medicine, or to afford all the information which the student needs ; but it supplies just what is necessary for the beginner. We should like to see some similar book prepared for the use of English students, unless perhaps Professor Schmidt's excellent work be destined to find a translator.

THE PRACTITIONER.

APRIL 1904.

TWO CLINICAL LECTURES ON PROGRESSIVE MUSCULAR ATROPHY.¹

By F. W. MOTT, M.D., F.R.S., F.R.C.P.,

Physician to Charing Cross Hospital; Pathologist to the London County Asylums, &c.

LECTURE I.

GENTLEMEN,

THERE are in the hospital at the present time three cases of progressive muscular atrophy, and they give me the opportunity of demonstrating to you some of the facts in connection with this disease, and of discussing with you its causation.

Now, muscle-atrophy may be due to several causes, and it is important that you should understand how to examine the muscles and distinguish the different affections.

Of course there may be general atrophy of the muscles of the body simply from emaciation ; or you may have a local atrophy from disuse, such as that occasioned by some joint-disease, or fixation of a limb, so that the muscles cannot be properly used ; or you may have a condition in which the muscles are affected, but not the nervous system, so far as we know, namely, idiopathic muscular atrophy.

We find that local atrophy, in which there is a wasting of individual groups of muscles, follows certain different types, of which I do not propose to speak further this morning than to point out to you that it is very often difficult to differentiate cases of so-called idiopathic muscular atrophy from true progressive muscular atrophy. The former, however, usually affects young people, and there is a family history of the disease, two or three members of a family being sometimes affected in a similar manner.

¹ Delivered at Charing Cross Hospital, Friday, December 4, 1903.

You will remember a lad who used to come to this hospital who had muscular atrophy. His father had previously been in the wards. The boy came to the out-patient department, and I immediately recognised a family likeness. He had atrophy of the facial muscles, of the muscles at the back of the neck and down the spine, and of those of the legs, resulting in a curious walk, which made me recall the father's case. I said "Here is a chip of the old block," and, sure enough, it was so. Afterwards, a brother came suffering from the same disease. So you see it is a family affection.

We have also to bear in mind the existence of atrophy due to neuritis ; and here again the lesson may be either local or general.

Lastly, we have the spinal progressive muscular atrophy, and it is about this last form that I intend to speak this morning. There are two forms of spinal progressive muscular atrophy ; at least, cases have been divided into two types. But really, if we consider the pathology of the disease, it will probably be better to look upon it as a condition affecting the motor system, which may either begin in the lower segment of the motor path, or may start in the upper segment, affecting the lower segment later ; or again, it may begin simultaneously in the upper and lower segments, so that the whole of the motor path is simultaneously affected. The disease presents different types according as the different groups of muscles are affected, and also as different portions of the motor path —that from the cortex to the spinal cord or that from the anterior cornua to the periphery—are affected. But I still recommend you to consider it as one disease with varieties. I think this will be the simplest arrangement, and the easiest to remember.

The progressive muscular atrophy where you have only wasting of the muscles, without any affection of the upper segment, would be termed the "Aran-Duchenne type," or the "protopathic" type, as Charcot called it. In that variety you have only the spinal motor neurons affected. If the disease begins primarily by atrophy of the lower neuron or nerve-cell, then of course the muscle-fibres will waste, and there will be no opportunity of finding out whether the upper neuron is simultaneously wasted or not, because there will be paralysis,

with wasting of the muscle fibres, due to the lesion of the lower segment. The innervation-currents can no longer go to the muscle from the brain, because the lower neuron is wasted, and at the same time you have the trophic influence removed. But if the disease begins in the upper part, of course there will then equally be loss of power over the muscles—paralysis—but it will be associated with a spastic condition of the limb, not with wasting of the muscles. This latter condition would be called “idiopathic lateral sclerosis,” which is generally described in text-books as a separate disease.

A series of intermediate varieties may be met with, between the condition where you have simply the lower part of the motor path affected, and that where you have a lesion of only the upper segment. You can easily imagine that in one part of the motor tract the lower segment may be affected, for instance, in the part governing the shoulder- and hand-muscles, while in another part—that controlling the legs—the upper segment is diseased. In such a case there will not be wasting of the leg-muscles, but a spastic condition, associated with atrophy of the upper extremities. Or you may even have the two conditions combined in one limb, so that there may be all sorts of intermediate forms. Again, when the lesion affects the cells of the medulla, it is spoken of as Bulbar Paralysis; and this again is often described as a separate disease, but the pathological process is just the same. It is for these reasons that I would advise you to try and remember that the disease of which we are speaking is essentially one which affects the whole motor path. It may begin either in the lower or the upper segment; it may affect one more than the other; it may affect the two simultaneously; or it may affect one part of the path in the legs only, and the other part in the arms. If once you understand the pathology of the condition, you can correlate the whole together.

If only the motor path is affected, and the sensory path entirely escapes, as we know to be the case in this affection, then you will not find the least evidence of sensory disturbance. That, of course, is the essential feature of this disease. As locomotor ataxy is essentially a degenerative process of the afferent paths to the central nervous system, so this is essentially a degenerative affection of the efferent systems of neurons

which conduct motor impulses from the centre, and control the actions of the muscles and their nutrition.

There are three cases, to which I have referred, in the hospital at the present time ; and I will read to you a very brief summary of the notes, and will also include a reference to six or seven other cases which I have had under my care, and in which I have had the opportunity of examining the cerebro-spinal axis microscopically. In the latter I shall be able to show you the morbid changes, which prove what I have said with regard to the degenerative nature of the process.

Case 1.—The first case was that of a woman, S. A., a dressmaker. She used a sewing-machine a good deal, and earned her livelihood in that way. The disease was of one year's duration, and commenced with a condition of weakness and numbness in the right leg, which gradually increased. It was attended by wasting of muscles and exaggeration of the deep reflexes ; and following this there appeared a similar affection of the right arm and hand, with a special wasting of the thenar and hypothenar eminences, and of the interossei. A little later on, the left leg was affected in a similar manner to the right. Finally, the left arm and trunk, the face, and the glosso-labio-laryngeal muscles became involved. The deep reflexes were all exaggerated at first, and there were no sensory defects beyond the numbness. This last, no doubt, was due to the fact that, if muscles do not move, and lose their normal tonic contraction, you do not get sensory impulses passing up to the brain, though the afferent path is open. It is this loss of the normal stimulus from the muscle which gives rise to the sense of numbness. If one tested her sensibility in any way, one found she could appreciate the lightest touch, as well as heat, cold, and pain ; and the stereognostic sense was not lost. Of course we know that there are sensory fibres in muscle, and these are almost as numerous in some of the muscles as the motor efferent fibres. They are connected with the muscle-spindles, and the sense of movement of the deep structures is due partly to these structures, and partly to the impressions coming from the Pacinian corpuscles and other nerve-endings around the joints. That path being open in the patient of whom we are speaking, and not in the least damaged, you could not expect to find that there was any

loss of sense of position. As a matter of fact, it was not lost in her case.

One could not discover, in the history of this patient, any cause for the onset of the disease, beyond the fact that she worked a sewing-machine, which may have determined the onset of the lesion in the right leg. I do not think that stress is really the cause of this disease ; it is, I believe, merely the agent which determines where the disease shall first become manifest. Nearly all cases begin in the group of muscles which is subject to the most stress ; but this stress is only a subordinate factor in the causation of the disease.

This patient had several attacks of dyspnoea, and the interesting part about her case was that, as the disease progressed, the difficulty of respiration became more marked. The upper part of the chest hardly moved at all ; and finally, I have no doubt that, through the glosso-labio-laryngeal palsy, some fluid got down into her bronchial tubes and occasioned bronchopneumonia ; and in one of these attacks she died. There was thus a combination of factors which caused death ; namely, (1) bulbar paralysis, which led to the possibility of fluids going down the wrong way ; and (2) failure of the muscles of respiration, so that she could not take a deep breath or rapidly expel any foreign body which got down the bronchial tubes. The foreign material set up an infective bronchopneumonia to which she succumbed ; and this is a common cause of death in these patients.

This case illustrates several points which you ought to remember in connection with this disease. As regards the course of the affection, you will have noticed how rapid it was, lasting only twelve months. Secondly, you will have seen how it terminated in the failure of the respiratory function owing to bulbar paralysis, and this is the common cause of death in progressive muscular atrophy.

On examining the nervous system after death, in this case, I found atrophy of the whole motor path. It was not simply the spinal neurons which were affected, but the whole motor path, including the Betz' cells in the cerebral cortex. Charcot and Marie had described a case previously in which these cells were atrophied, and this case was interesting as affording corroboration of their discovery. None of the other cells of the

cortex were affected at all. I am pointing this out to you because, if you are acquainted with the pathology, you will understand the diseases so much better. One found that the large cells in the fourth layer had disappeared, while all the other layers were normal. You cannot explain such a condition by any inflammatory process, because if it were inflammatory, or if it were due to some coarse lesion, such as changes in the blood-vessels, we should find all the other cells in the neighbourhood equally affected. As a matter of fact, one found exactly the same condition in the cerebral cells as is found in those of the anterior horns, namely, a progressive wasting of the large motor Betz' cells, and the replacement of the glia-tissue in these particular areas by spider-cells, such as you find in the anterior cornua. If you will bear that in mind, you will be the better able to understand what I shall speak of later.

Case 2.—E. H., æt. 33 was an unmarried woman, and her occupation was that of general servant. Her appearance suggested congenital imbecility ; she had a small head, and a large protruding jaw, and a physiognomy which was of a low type generally. The duration of her illness was fifteen months. There was general wasting of muscles, most pronounced in the arms and in the small muscles of the hands. There was present the condition known as the *main en griffe* or claw-hand, owing to paralysis of the interossei and the lumbricales, resulting in an inability to extend the two terminal phalanges, while the metacarpo-phalangeal joints are over-extended. Her speech was affected. I would specially call your attention to the speech-affection, and to the fact that she was of a low type. Consequently she got landed in an asylum ; and if you get in an asylum a case of speech-defect and congenital imbecility with progressive paralysis, the diagnosis of general paralysis is immediately made. But it was not a case of that nature, but one of ordinary bulbar paralysis in a person of low intelligence. Directly I saw the case, I disputed the diagnosis, and, as events turned out, I was perfectly right.

This patient had loss of control of the sphincters. You find this sometimes present in these cases, sometimes not ; indeed as a rule it is not present. Probably in her case it was due to the fact that she was an individual of a low mental type ; and

of course this symptom made the asylum authorities suspect a progressive dementia, for the inability to control the sphincters is one of the signs of the disorder. Loss of control over the bladder and rectum is usually described in asylum notes as "wet and dirty in habits"; but it was not her fault at all, since she could not control the sphincters.

The deep reflexes were exaggerated in connection with the atrophy; and such a condition of course showed that there was at work a simultaneous wasting of the lower and of the upper segment. Another point of interest was that she suffered from polyuria. Sometimes, when there are bulbar symptoms, you meet with polyuria in these cases.

On examining the nervous system after death, I found exactly the same condition of things as in the previous patient. There was wasting of the large Betz' cells of the cortex, with replacement by spider-cells. There was no atrophy of the tangential fibres or of the pyramidal cells of the cortex; the process was a localised degeneration in exactly the same region as noted in Case 1. This fact absolutely proved that the disease was not general paralysis, because the characteristic pathological change of general paralysis, and the earliest change of all, is the disappearance of the highest association-neurons of the superficial layers of the cortex, and wasting particularly of the tangential fibres. The morbid anatomy showed that it was a case of true amyotrophic lateral sclerosis with bulbar paralysis in an imbecile person.

Case 3.—The third case is also very instructive. It was that of a man who was admitted into Charing Cross Hospital, and whom perhaps some of you may remember. He was under the care of Dr. Abercrombie at first, and then later he was transferred to my care. He was aged 67. For a short time before the disease came on, he worked in a white-lead factory, and that is of some importance in connection with the determination of the disease and the rapid course it pursued. The case was one of amyotrophic lateral sclerosis, of 11 months' duration, beginning with painful cramps, which were followed by loss of power in the right leg. Then the left leg, the right arm, and the left arm successively became involved. There was general muscular wasting, most pronounced in the small muscles of the hands. There were also exaggerated reflexes,

and, later, loss of control over the sphincters, but there was no impairment of sensation. He became extremely helpless, and eventually delirious, and died with pronounced bulbar symptoms. Microscopically one found a rapid and recent degeneration of the projection-fibres in the motor area of the brain ; also of those in the corpus callosum, for you know that these cells give off fibres which pass through the corpus callosum to the other hemisphere. If you have the whole neuron degenerated, you see the degeneration in the cells of the cortex. The degeneration probably begins at the terminals of the neuron ; that is to say, the outlying portions of the cell are the first to waste. In this case the cells had not disappeared ; the death of the patient was so rapid that only the axon (axis-cylinder) had disappeared, as shown by the acute degeneration which was manifest in the spinal cord. And what was still more interesting was the fact that you could trace complete atrophy of the fibres only as high as the upper part of the pons. Above that there was only the acute recent degeneration, with no replacement by interstitial fibrous tissue. Consequently we must suppose that in this disease you may have, and probably do have, a wasting of the terminals first of all ; and that the process gradually proceeds up, until it affects the cell-body, and the cell itself disappears. The last part to disappear is the portion of the protoplasm around the nucleus, for the nucleus is the trophic centre of the whole neuron ; and this illustrates the point to which I want to draw your attention. In one case published by Senator the patient had all the symptoms of amyotrophic lateral sclerosis, that is to say, wasting of the muscles combined with those electrical reactions which indicate degeneration of the lower neuron. But, although the deep reflexes were exaggerated, and everything suggested that the upper part of the path was also diseased, yet microscopical examination failed to show any degeneration whatever in the crossed pyramidal tracts. We must therefore suppose that the degeneration had affected the terminal arborisations of the upper-segment fibres around the cells in the grey matter of the cord, and had not proceeded to the main trunks of the axis-cylinder processes forming the lateral columns. What is generally believed now is that there is an intercalary neuron between the two segments, which brings into relationship the

upper neuron and the lower. Probably that had disappeared in this case, and there had thus occurred a break of continuity ; and in consequence of that break the inhibitory influences had been cut off from the lower spinal neuron, so that there was an exaggeration of the deep reflexes.

Case 4.—The fourth case which I will read to you is a very interesting one, and I shall show you some specimens taken from this patient as illustrating one of the extreme types, together with microscopical specimens of the first case which I have described. This case was that of E. S., æt. 57, a cabman. He was admitted into this hospital under Dr. Abercrombie, and then came under my care, for progressive muscular atrophy, of four years' duration. You will observe that the duration was much longer in this case than in the others which I have related. It began with weakness in the right arm, and four months later affected the left arm. There were weakness and atrophy of various muscles of the arms and shoulders, with absence of reflexes. But the weakness was so complete, and the atrophy of muscles so marked, that this man was unable to button and unbutton the fly of his trousers. He was out of doors all day, and consequently he suffered from an inability to empty his bladder, and he came to the hospital with an enormously distended bladder, which he had had for a long time, with resulting incontinence of urine. This condition set up cystitis, and he really died from that and from the suppurative nephritis which supervened—all in consequence of his inability to use his hands in unbuttoning and buttoning-up his trousers when he was out. He himself attributed it to that, and I think it is quite a possible explanation. The muscles of his hands were completely wasted, and when you look at the specimens, you will see what an advanced atrophy there is.

In this case, as I have said, the duration was four years. He was lifting a heavy box off his four-wheeled cab—for I suppose that by this time he had descended to a "four-wheeler," having at one time driven a hansom—and while lifting this box, owing to the weakness which had come on, he let it fall on his spine. The disease was therefore attributed to this accident, and certainly he had a much more rapid progression of the symptoms after this. But undoubtedly the

malady had been coming on for some time previously. That is often the case, as in one which I shall show you. There is apparently a sudden onset of acute symptoms, but when you go into the case you find there is a history of weakness and wasting extending over a considerable period of time before this. The interest in the case of which I am now speaking is, that only the lower segment was affected in him, while the upper part was not involved at all ; and you can correlate that with the slow progress of the case as compared with those others of which I have given you an account. Where the upper segment was affected, the patients were dead within 18 months ; but in this case, where only the lower segment was affected, death did not occur for four years ; and if he had been careful, probably he would have lived longer, because the complications connected with his bladder would not have supervened. I said that the deep reflexes (that is, the knee-jerks) were exaggerated, but he had not ankle-clonus or Babinski's sign, so that probably the upper segment was not affected, even at its terminals. There was no degeneration of the pyramidal system in this case ; it was a pure instance of the Aran-Duchenne type, or protopathic muscular atrophy, as distinguished from the amyotrophic (or, as Charcot called it, deuteropathic) muscular atrophy.

Cases 5 and 6.—I have notes of two other cases, but I will not read them to you ; I will only touch briefly on the main points. One was a cooper who had passed middle life. He was admitted on account of wasting of the muscles of the shoulder and hand, on the right side. I found that his work was to wield a 4-pound hammer. After his right hand began to get weak, he used to try to do it with his left, when, of course, the stress came on his left hand, and the muscles of the left arm became affected. Another case was an Italian waiter. He was a right-handed man, but was affected in the muscles of the left shoulder and hand ; and I believe his extensor muscles were affected before his flexor—an interesting point, because the reverse is usually found. If you remember the familiar figure of the Italian waiter, with the tray poised on his left hand, and taking the money with his right, you can understand how stress would tell upon those particular muscles ; and although many authorities—Sir William Gowers among them—

do not attach much importance to stress, I certainly think that, though it is not the cause of the disease, it plays an important part in the condition, as several of these cases show. Certainly it has an important bearing on the point at which the disease will commence.

We will now have our present patients brought in.

Case 7.—This man, C. G., is aged 30. There is nothing in his history which I need trouble to read to you, beyond the fact that he denies syphilis, for syphilis is said to be a cause in some of these cases. I will sum up the causes presently. The facts in connection with this case are :—The history seems to have begun with an attack of influenza, after which he suddenly noticed that his right leg began to waste. It wasted rapidly, and he got much pain in the back. He subsequently recovered strength a little, he thinks.

On examination of the nervous system we find that the mental functions and intelligence are good, and memory is not affected. He sleeps well, and his speech is not defective.

Motor Functions.—There is paralysis in the right lower limb ; there are no tremors, but fibrillary twitchings are visible in both legs. The grip is only 40 kilogrammes with each hand ; a weak person can grip up to 100, so that 40 shows marked loss of power in the grip, and when you look at his hands you will see a reason for that. The muscular power of both arms and of the left leg is good compared with that of the right leg, which is practically paralysed. There is no sensory defect of any kind, and no loss of control over the sphincters. The knee-jerk is absent on the right side, present on the left ; there is no ankle-clonus. Once a crossed reflex was obtained ; that is to say, tickling the sole of the right foot produced a reaction in the left, unparalysed, foot. That sometimes occurs, owing to the fact that the sensory impulses are conveyed to the opposite side of the cord, although not to so great an extent as to the same side. You see quite plainly that there is marked wasting of the muscles of this right leg. You also see that the muscles of the buttock of the same side are affected. The following muscles are affected : the gluteus maximus on the right side is wasted and powerless ; the hamstrings are weak and flabby ; the tensor vaginæ femoris is wasted and powerless, and so is the sartorius likewise. You see that the extensor muscles both of the hip and

of the foot are more affected than the other groups, and the muscles of the front of the leg more than those at the back ; and that is the usual condition in these cases. Practically the whole of the quadriceps is gone. The adductors are not so much affected as the quadriceps, and this also is the usual condition. You can see the fibrillary tremor plainly. Now of course a sudden onset such as here occurred would make one hesitate to say whether it was a case of progressive muscular atrophy. There is a form in which the leg begins to be affected first of all—the peroneal type, affecting very young people as a rule—in which, after an acute illness, wasting of the muscles of the leg comes on, especially the peroneal group. But we have got other signs in this man. The small muscles of the hand are affected, which accounts for the weakness of his grasp. You will remember that the investigation of muscular atrophy should be conducted both by inspection and by palpation. You can see for yourselves the obvious difference between the right and left leg, both front and back ; and if you feel the muscles, you find that they are soft and flabby. Secondly, there is a loss of muscular power, as shown by the fact that he cannot move that leg at all ; he can only rotate the hip inwards a little.

The patient has not got a "claw-hand," but there is a general wasting of the thenar and hypothenar eminences, and wasting particularly of the abductor indicis ; but also, more or less, of all the interossei, as shown by the depressions which you can see between the metacarpal bones. There is a wasting of the lumbricales muscles, and you can see the tendons, with the intervals between. You can also see what is called the "ape-like hand," that is to say, the ball of the thumb is gone ; it is quite flat there, as is the case in the ape. You can see the fibrillary twitchings in the interossei. He has not got exaggeration of deep reflexes, even on the side where the muscles are not wasted, showing that it is only the lower part of the motor path which is at present affected ; and, from what I have told you before, you will know that the prognosis is better than it would be if a large part of the motor efferent system were involved.

With regard to the electrical reactions : as a rule, when the wasting is slow, you have a diminution of faradic and galvanic irritability, the faradic being more affected than the

galvanic ; and eventually the muscles will not react to faradism at all, although you may get them to respond to galvanism. If the wasting is very rapid, you may occasionally get increased galvanic irritability with loss of faradic irritability, and the anodal closure-contraction coming before the kathodal. That of course is indicative of the reaction of degeneration ; but where the disease is a slow process, the reaction varies.

To sum up, this case began in the hand-muscles ; possibly it may have been determined there by the continual holding of the reins. The wasting is obvious, but it is evidently a slow process, and it may be arrested in the right hand. If you compare the two hands, you see that the tendons are much more marked in the left palm than in the right.

Case 8.—The next case is that of F. S., aged 21, a carman. He was admitted on November 19 on account of a partial loss of power in his left arm, which has existed for eight or nine weeks. There has also been some numbness of both deltoid regions. That is of interest ; these patients very often complain of numbness or cramps in the muscles which are being atrophied, as I have told you. He is uncertain whether motor or sensory symptoms arose first, but thinks that they occurred at about the same time. Numbness is still present. It is not a numbness of tactile sensibility, but is owing to the fact that the muscles are not providing their normal stimulus to the brain, owing to the loss of tonic contraction in them. Now with regard to the man's past personal history :—There is no history of any complaint of importance, except syphilis ; he was admitted to the Lock Hospital about nine weeks ago, and since then he has been treated for this disease. The chancre was noticed about four days prior to his admission there, so I do not think the syphilis had anything to do with the muscular atrophy, because he had signs of the atrophy before he acquired the syphilis. He says he has always been a very moderate drinker. He first noticed that the left shoulder was weak at about the same time as he had the chancre. He had pains in the arm when he acquired syphilis ; but he is not very clear about the succession of events. We are told that he lifted a costermonger's barrow for a wager, and possibly that, with the poison which was circulating in his system, determined the wasting. We must, however, always remember that there

may have been wasting in the shoulder-muscles long before it was noticed, because it is a part which is covered up ; and the patient not being very well able to see it or the muscles of the back, especially those of the spine, his attention was not directed to these regions. But the attention of sufferers from progressive muscular atrophy is soon attracted to the fact that they cannot write or perform some other delicate hand-movements, by which they perhaps earn their living. And when you come to examine such a patient, you will find that the muscles of the shoulder are affected, although the patient has been unaware of it ; he has considered that there was merely a little stiffness in the joint, or something of that sort. So we must not attach undue importance in this case to the association between the lifting of the barrow and the syphilitic poison as being the causes of this muscular wasting. You can see the head of the humerus on the left side very distinctly, and the spine of the scapula still more distinctly, but the acromion process is apparently normal. There is an obvious wasting of the supra- and infra-spinatus muscles, and you see how the scapula projects, almost like a wing. The man can throw his shoulder-muscles back, but not so much on the left side as on the right, because there is commencing atrophy of the lower and middle portions of the trapezius, and also some wasting higher up. The last part of the trapezius to go is the upper portion, coming from the occiput. This man can shrug his shoulders, but, as is frequently the case, cannot throw the shoulders back. There is decided weakness of the pectorales muscles, which is more marked on the left side. There is no wasting of the hand-muscles. On the left side there is some weakness of the pectoralis major. The deltoid is wasted on the right side as well as on the left, but the patient can raise the right arm above the head laterally, though he has more difficulty in doing that with the left arm. The supra-spinatus is normal on the right side, and so is the levator anguli scapulæ, but the latter muscle is weak on the left. The teres major and latissimus dorsi are normal on the right side. I see the notes say they are hypertrophied on the left ; but that, I think, is more apparent than real ; it is owing to the wasting of the other muscles. Some muscles, which are affected late, stand out prominently on account of the disappearance of their

neighbours. The rhomboids are normal on the right side, weak on the left. The sterno-mastoids are unaffected. Sometimes there is marked weakness in the spinal muscles, so that the head drops forward or backward, and it is difficult to get it upright again ; the patient has to do it by jerking the whole body. Occasionally these people cannot move the head laterally because of the wasting of the sterno-mastoid, trapezius, and other muscles.

The electrical reactions in this case are as follows :—In the deltoids there is diminished reaction, both to faradism and galvanism ; it is distinctly less on the right side. In the left deltoid K.C.C. is greater than A.C.C. On the right, K.C.C. = A.C.C. The reaction of the small muscles of the hand is better on the right side than on the left, both to galvanism and faradism, but a stronger current is required, so that there is a quantitative diminution. The leg-muscles are unaffected.

The wasting has begun in the shoulder-muscles, and according to Sir William Gowers, nine-tenths of the cases of progressive muscular atrophy commence with a wasting either of the shoulder- or the hand-muscles, or of the two simultaneously, the leg-muscles being much less frequently affected first. In the previous case, indeed, I think it is highly probable that the hand-muscles were wasted a long time before those of the leg. The chances are about equal that the disease will appear first in the shoulder-muscles, particularly the deltoids, or in the small muscles of the hand.

The special senses and common sensibility in this case are unaffected ; in fact there is no loss of sensibility in any form whatever, nor are the sphincters affected. The knee-jerks are markedly increased, the left more than the right ; but there is no definite ankle-clonus, no patellar clonus, no extension of the big toe in the plantar reflex. The triceps-jerk is increased on both sides. So probably there is some affection, though slight in degree, of the upper segment.

Case 9.—The next patient is this man, Alexander K., æt. 48, a baker. He complains of weakness in the left arm, and pain in the second intercostal space, two inches outside the sternum. Two months ago the patient noticed a trembling of his biceps, and also in the interosseous spaces of the left hand. Weakness gradually came on at that time. He is a right-handed man, and

his employment necessitates his carrying heavy weights ; he uses both hands when working. The weakness began in his left arm, and I think there is an association here between stress and the place of onset. Though he is really a baker, and has worked as such for many years, he has recently taken to work as a labourer, his occupation being to shovel earth into a cart. In this work, in the case of a right-handed man, the whole of the leverage comes on the left hand and arm. When he found, in consequence of weakness of the arm-muscles, that he could no longer shovel properly, he tried to do it, with the other hand, and then he found there was weakness of the right hand as well. He says that he has had some pain in the left side of his chest, but as it has been there for twelve years, you may regard it as of no significance.

There is nothing in his previous history to account for this condition coming on ; no history of syphilis or of alcoholism, or of his having been exposed to cold, or wet, or both. And in the family history there is nothing neuropathic. Those are some of the most important causes in the *aetiology* of the disease.

With regard to the muscular system in this man's case, he puts his left hand on to the top of his head with difficulty ; there is an obvious wasting of the shoulder-muscles, though not nearly so marked as in the last case. You can see fibrillary twitchings in the infraspinatus. The abductor brevis pollicis is atrophied on the left side ; there is some wasting of thenar and hypotenar eminences, more marked in the left hand than in the right, and the tendons are more visible on that side. The trapezius is not so much affected. Often the deltoid is not affected equally throughout ; sometimes one half is affected more than the other. Different parts of the deltoid act in association with different groups of muscles, and have a different spinal representation as regards the neurons which control the fibres belonging to the several parts. So you may get atrophy of one group of neurons in the spinal horns, causing atrophy of a definite portion of the deltoid, the remainder of that muscle being unaffected. The same may be said of the trapezius and other muscles in which there are attachments of considerable extent.

I want now to sum up some of the principal facts. You

have seen these cases, and you have heard the notes of the others which I have related to you. They illustrate certain points, which will enable you more fully to appreciate the ætiology, the symptomatology, and the pathology of the disease.

Causes.—I have related to you nine cases, seven of them males, and two females, a proportion of about one female to three males, which agrees with what Sir William Gowers gives.

Age.—I have shown you a case, aged 21, and have related one aged 67; the other cases occurred between these two extremes. This is essentially a disease of middle adult life, but it may occur at an early period or at a very advanced age. The youngest case on record, I believe, was aged 12, and the oldest 70. We came nearly to the maximum age in the man of 67. In a considerable number of cases there is a neuropathic history; that is to say, there are other nervous diseases in the family. But you must not lay too much stress upon that, because if you go into the family history of most people nowadays, you will find that a large number of them have a neuropathic history. In some cases there is a direct inheritance, that is to say, several members of a family are affected, but that may be merely a coincidence. When you get muscular wasting in several members of a family, it is nearly always a progressive idiopathic myopathy, not this form of disease.

Injury.—Blows on the spine, or concussions, may often be found in the history of these cases; but you know that this must not be regarded as too important, because people will frequently remember that they have had a fall. But a fall on the spine is more likely to be a precursor of cervical pachymeningitis than to have anything to do with the condition with which we are dealing. In the case of the cabman, whose case I related to you, no doubt the fall of the box on his back accelerated the disease very markedly; but he had atrophy of muscles before that came on. With regard to the effect of stress, this undoubtedly does influence the first localisation; it determines which group of muscles shall be first affected, but it does not determine the onset of the disease itself. It is a causative factor of some importance, especially in regard to

localisation. Worry, anxiety, and fright have in some cases preceded the onset of these conditions, but I am a little sceptical about their being really anything more than an exciting cause. With regard to alcoholism and lead-poisoning, we have had one example where lead, if it did not determine the disease, certainly conduced to its rapid progression. Lead-poisoning alone is usually non-progressive, whereas this is a progressive disease. There is a history of syphilis in a considerable number of the cases, and some of the instances of the disease are undoubtedly due to over-mercurialisation, that is, the injudicious use of mercury in treatment. In the cases in which atrophy has followed an acute specific disease, especially measles, and has begun in early life, it is probable that the malady was a chronic neuritis. I am quoting Sir William Gowers on that point, because there is a difference of opinion about it, and it is better to have the statement of someone of authority.

Now with regard to the *symptoms*. The affection is sometimes preceded by a dull aching pain or cramp in the part which afterwards becomes wasted; sometimes by numbness, as you have heard in several of these cases. At other times there is pain in the spine or elsewhere, or a sense of coldness in the limb. The wasting of the shoulder- and back-muscles may have gone on for some time before it was noticed. As I have already pointed out to you, this is on account of the fact that these parts are covered with the clothing, and until a considerable amount of wasting and weakness has occurred in them, the defect is not noticed. But it is different with the hands, especially if the person's occupation is one requiring great dexterity of fingers. Impairment of writing or of some other delicate operation with the fingers is therefore often the first indication that the patient is suffering from muscular disease.

In the patients whom I have just shown you there was not much subcutaneous fat; but sometimes wasting may be obscured by an increase of subcutaneous fat.

I have pointed out that nine-tenths of the cases commence in the upper extremity, affecting the shoulder and the hand-muscles in about equal proportions. You very seldom find that the muscles are symmetrically affected on the two sides.

Another diagnostic point of importance is that fibrillary twitchings will be observed, perhaps in the same muscles, perhaps in other muscles, of the opposite side; and then the disease will progress on that other side, and become stationary on the side first affected. It goes on in an insidious and progressive manner as a rule, and that is the character of the disease—an insidious and progressive muscular atrophy, without loss of sensibility.

In the hand, the thenar and the hypothenar muscles and the interossei are especially liable to be affected, so that you get, as you saw in one or two of these cases, a marked prominence of the metacarpal bones, and a wasting of the ball of the thumb and of the prominence over the base of the little finger. At the same time the tendons in the palms of the hands become unusually prominent owing to the wasting of the lumbricales. When the small muscles of the hand become extremely wasted, you get the condition of "claw-hand"; but before that, you see the ape-like hand. The flexors are usually affected before the extensors; the supinators are affected sometimes at the same time as the flexors, sometimes afterwards, but before the pronators. With regard to the shoulder-muscles, as these cases show, the deltoid is especially liable to be wasted, and in most instances it is the first muscle to be affected. Wasting becomes obvious by the appearance of the rounded contour of the head of the humerus under the acromion process. Part of the deltoid may suffer and part escape, at least until later. The triceps, as you saw in one of these cases, is usually less wasted, and suffers later than the biceps and the coraco-brachialis. In the first case which I showed you, you noticed how markedly wasted were the supraspinati and infraspinati, and also the deltoid; and they are early affected. Again, the deep muscles of the back are affected; sometimes the condition begins in them. The trapezius, like the deltoid, may be markedly affected in one part and not in another; in fact the upper attachment of the trapezius is the last to die, and was called by Duchenne the "ultimum moriens." The serratus magnus, the latissimus dorsi, and the pectoralis major are often affected, but usually later than the muscles of which I have already spoken. But, just in the same way as with the deltoid and trapezius, the pectoralis

may be partially affected ; thus you saw in one of these cases that the upper attachment was less affected than the lower. The platysma is the last affected of all muscles, and usually it is not involved at all.

With regard to the trunk-muscles, the affection of the muscles of respiration, as I pointed out to you in the first case, may be one of the causes of death. The intercostals, and even the diaphragm, may be affected. According to whether the upper or the lower intercostals are affected, you will get different types of thoracic paralysis. Sometimes you find that the upper part of the chest moves owing to the extraordinary muscles of respiration being brought into play ; and sometimes the chest hardly moves at all, and the diaphragm descends and bulges out the abdominal wall. You may get various types of respiration according to the muscles affected.

With regard to the lower limb, the extensors of the hip are particularly likely to suffer, as I showed you in the first case. The gluteus maximus was markedly affected, the extensors of the knee and the quadriceps had almost disappeared, and the muscles in the front and outer part of the leg—the tibialis anticus and the peronei muscles—were very weak, giving rise to a condition of foot-drop and inversion. When the extensors of the hip are affected on both sides, the patient, in order to maintain his balance, throws the body back, and lordosis is produced. I remember one man being in this hospital whose particular affection was a weakness of the back-muscles, and his head was thrown forward and his back arched in a marked lordosis ; it was a very characteristic condition.

The face usually escapes, but the glosso-labio-laryngeal apparatus—that is to say, the muscles supplied by a group of ganglion-cells in the lower part of the bulb, called the glosso-labio-laryngeal nucleus—is especially liable to be affected, and it is the most dangerous symptom which can arise, as it is certain to prove fatal within a short time.

As I have already pointed out, various deformities occur, and bony prominences become visible ; but the most important deformities are the claw-hand, typical of the Aran-Duchenne type of the disease, the lordosis from weakness of the extensors of the hip, and various contractures, which I will not detail now.

Electrical Excitability.—If the wasting is slow, you find

a diminution in the faradic and galvanic irritability, and the amount of contraction becomes progressively less as the wasting goes on. Usually the faradic excitability disappears before the galvanic. If the wasting is rapid, there is a loss of irritability to faradism and galvanism. Sometimes you find the reaction of degeneration present, and tetanic contraction is produced with undue readiness. The mechanical irritability of the muscle, that is to say, the effect of tapping the tendon or muscle, may be increased; but of course in the atonic variety, where you have only the lower segment affected, and that markedly, this property is lost. If you have the two segments simultaneously affected, the myotatic irritability may be increased until these muscles are completely atrophied. If the degenerative process is more marked in the upper segment than in the lower, then the deep reflexes will all be exaggerated in proportion. There is no loss of sensibility, and that is the characteristic feature of this disease. There is also no loss of the sense of position, and usually the sphincters are unaffected.

The *diagnosis* has to be made from injury to the nerves of the brachial plexus; from joint-disease, leading to disuse and consequent atrophy, and this sometimes even leads to an actual degenerative process in the muscles; from local neuritis and multiple neuritis; and from cervical pachymeningitis. Also you have to differentiate it from chronic disseminated myelitis, syringomelia, and idiopathic muscular atrophy. In the first five which I have mentioned you would usually find something characteristic in the history; the onset may be acute, or there may be sensory disturbances which will enable you to make the diagnosis. In the last, as I have said, you have a wasting of the muscles coming on in the young people of one family.

The *prognosis* of this disease depends very much upon whether you have the upper and the lower segment simultaneously affected, because, if the upper segment is affected, no doubt the disease runs a more rapid course, and it is more liable to end in bulbar paralysis than where the lower segment is affected. The disease is more likely to occur in middle life than in old age. Moreover, in the case of the man of 67 it only lasted a few months before the fatal termination. Arrest is more likely when the atrophy is quite symmetrical. If you find bulbar symptoms or the muscles of respiration affected,

then of course the prognosis at once becomes serious, because complications are likely to arise. If the patient becomes bed-ridden, bedsores may develop, if care is not taken, and may lead to death through septicaemia. There is little hope of any recovery from this disease, but the process sometimes goes on slowly, or it may be arrested. As I have already said, it is more likely to be arrested if it is symmetrical. The nerve-elements are perpetual elements, that is to say, they are all there at birth ready to grow; if anything destroys them, they cannot be replaced. Therefore the most you can hope for is, that other muscles or other structures will take on the functions of those which are destroyed, to a certain extent. You cannot restore these muscles if the nerve-cells are dead.

Treatment.—The treatment is to avoid complications, to keep the patient in as good health as you can under the circumstances, and to avoid exposure to cold and wet, because, as we have seen, the dangers of lung-complications are great. These patients' vitality is low, and therefore they require great care. They must avoid stress, particularly if they have bulbar paralysis. You must also be very careful about feeding, because if you are not, food, and especially fluids, will get down the wrong way, and bronchopneumonia will be set up, owing to their inability to expel that food. At post-mortem examinations one does find milk and egg and such substances in the bronchi, and that is the cause of death. Bed-sores should not arise in these cases, because there is no reason for them, except carelessness on the part of the nurse. If the patients are wet and dirty in their habits, as I have said they sometimes are, owing to the weakness of the sphincters, there is more difficulty in preventing bed-sores. But still, even in the worst cases of that kind, with care, bed-sores can be avoided. It is a different matter when you have actual lesions which may cause trophic changes in the skin. Drugs are not of much value, as a rule, but Sir William Gowers strongly recommends—and we shall try it in this case—hypodermic injections of strychnia. He says that he has produced remarkably good results in six out of seven cases by this procedure ($\frac{1}{80}$ gr., increased to $\frac{1}{10}$). After treatment for two or three weeks in this way, an interval of a week should be allowed. Arsenic may be given in some cases with advantage. Not much good is obtained from mercury or

from iodide of potassuim. When giving mercury in large doses in cases where there is a history of syphilis, you have to be careful, because you may set up the very condition which you wish to cure. At the same time I shall be inclined to give mercury to that lad of 21 who has so recently had syphilis, because, unless he is so treated, we do not know what may happen. It would not be advantageous to give mercury and iodide to a case of progressive muscular atrophy in which there was a history of syphilis long before, as in tabes dorsalis we find that it does not do good, nor yet in general paralysis. The mischief to the vitality of the cells has been done long ago, and you cannot alter that condition by giving iodide of potassium and mercury.

I must defer consideration of the pathological anatomy until another occasion, as there is not time to discuss it now.



TYPHUS IN EGYPT.

By F. M. SANDWITH, M.D., F.R.C.P.,
Consulting Physician to Kasr-el-Ainy Hospital, Cairo.

Synonyms :— Homa Typhusyeh—Naushah—Prison Fever. It must be explained that the Arabic word Naushah does not represent one definite disease, but is used indiscriminately for typhus, relapsing fever, pneumonia, and very bad cases of enteric or influenza. It signifies, therefore, any acute febrile disease in which the patient becomes delirious. The word is said to be derived from the Coptic, and means “ stupor.”

HISTORY.

Typhus has been described in Europe since 1505, but no pandemic has occurred since 1815, for it has gradually yielded to improved sanitation in all countries. It is still, however, sometimes present in Russia, Germany, Austria and Ireland. In 1878 I saw much of it after the Russo-Turkish war, for on the Russian side alone there were said to be 100,000 sick from typhus, of whom 50,000 died.

Probably the outbreaks of plague in Egypt masked typhus-cases, for there is no record of epidemic typhus till 1836-7, when no less than 3,000 Egyptian and Soudanese soldiers were admitted to Kasr-el-Ainy hospital suffering from this disease, out of a total of 7,000 sick. Pruner says that they filled up all the wards and corridors of the hospital, and communicated the disease to many of the doctors and to two-thirds of the attendants in the hospital; and that one-third of the patients died, mostly between the seventh and eleventh days. He ascribes this epidemic, which began in the winter and lasted till the following summer, to the following causes:—The soldiers were unhappy, unwilling conscripts, who had been made to march long distances under circumstances of great cruelty; they were terribly overcrowded in barracks, and fed on diet to which they were unaccustomed.

Pruner also states that typhus was very common at this

time in Egyptian factories, because the workmen were shut up in hermetically-closed rooms to prevent their running away!

Griesinger saw 63 cases of typhus in 1851-2 among the Egyptian soldiers. In 1864 and in some former years malignant typhus was reported from Khartoum, and in 1876 there were a few cases in Cairo. Yet when I took over the Sanitary Department in 1884, all these previous outbreaks had been forgotten, and I was assured on all sides that the disease was never seen in Egypt. This was the more inexcusable because I have since found out that until this time typhus was present almost every year in the students' dormitories of the Medical School. This instance is enough to show to what a depth of ignorance the Egyptian doctor of that day had descended. In August 1884 "typhoid fever" was reported from a village near Zagazig, which proved to be not typhoid, but a combination of typhus and relapsing fever. In 1886, between March and June, a severe epidemic of both typhus and relapsing fever occurred at the old Tourah convict-prison (then containing 964 prisoners), producing a mortality of 148 in April and 106 in May, which by sanitary measures was then stamped out. Including two of the attendants, I saw there 32 cases, of whom 21 died. Since 1884, when I first introduced statistics into the Sanitary Department, typhus has been reported from a few villages every year, generally in the spring months.

DISTRIBUTION.

Unfortunately, the Sanitary Department is not able to assume that its provincial officials can correctly make a differential diagnosis between the various Egyptian fevers, and this is the less to be wondered at when it is remembered that many men and most women are not seen by the medical officer during life, and that, therefore, the diagnosis has to be made from the appearance of the corpse and from such history as is vouchsafed by the friends. Therefore four fevers, typhus, relapsing, enteric, and "bilious fever" (probably Weil's disease), were until 1903 all returned under the objectionable heading of "Fièvres typhiques." The last two are distinctly rare, and therefore the bulk of the returns under this heading

must be typhus and relapsing fever, which often coexist in Egyptian epidemics.

During the fifteen years 1886-1900, 17,990 deaths have been reported under this combined heading; of these 1,327 were Europeans, and it is fair to assume that most of them were enteric. During the same years, 19,633 cases under the combined heading were admitted into the various hospitals and ambulance tents in the whole country, giving a mortality of 3,913. Every year the number of cases admitted into hospitals is greater, which means, not that the diseases are more prevalent than they used to be, but that the medical officers of health are more energetic, and that the lay officials are more willing to notify and to assist in isolating infectious cases.

There are as yet no returns from the Soudan, but it may be assumed that typhus can exist during the spring months in any part of Egypt or the Soudan where persistent over-crowding and other causes exist. In both the Egyptian and the English armies during the same years typhus has been unknown, because of course the men live a sanitary life, but I remember one sporadic case which mysteriously occurred in an English officer quartered in Alexandria. Typhus is still one of the dangers of the provincial prisons, which, from lack of funds, are sometimes dangerously overcrowded. The last serious prison-epidemic took place in Alexandria early in 1902, the infection having been brought from a temporary "lock-up" in a country district, and it caused 198 cases with 51 deaths.

CAUSES.

I have never seen any case under the age of five, and the greatest number of patients seem to be men between twenty and fifty, though, when a village is infected, there are necessarily some cases among the women too. The hospital cases consist almost entirely of Egyptians, Berberins, and, to a smaller extent, the Soudanese; but I have seen a few cases among Greeks and Syrians, and one in an English servant-girl.

The *season* of the year is, as I have said, of great importance; for instance, in 1901 the cases admitted to the "infectious" hospital at Abbassieh numbered forty, of whom thirty-eight were admitted between March and August, while only two entered in the other six months between September

and February. At Kasr-el-Ainy hospital I have had during eleven years 151 cases in my wards, all between February and October ; but these are never now kept in the hospital, for directly the diagnosis is made, or even suspected, they are transferred to the infectious hospital in the desert. In former days, before an infectious hospital existed, we were less careful about dismissing cases promptly, and as a consequence some of the male hospital orderlies caught the fever, and at least one of them died from it. December and January would seem to be months when typhus is the most rare. It must not be forgotten that these are the coldest months of the year, when the villagers crowd into their huts at night with their sheep, goats, and poultry, and stuff up all windows and crevices with rags. Typhus discovered in the spring months (March to May) is thus always preceded by some months of overcrowding and ill-ventilation. Griesinger, however, saw some cases in January. Since 1868 unsuccessful attempts to penetrate the bacteriology of typhus have been in progress, but all we can say now is that there must be a specific microbe, and that it will, in all probability, be found in the blood. Until the microorganism is discovered, we can only deal with the predisposing causes, which experience has taught us are favourable to the spread of the disease, and which some day will be found to be the conditions which are most suitable to the microbe. It is often impossible to trace the infection, but the old doctrine of spontaneous generation of typhus is opposed to all analogy, and need not be discussed.

The prevalence of typhus is favoured by previous illnesses, bodily fatigue and pain, loss of sleep, alcoholism, mental anxiety and depressing emotions. The chief predisposing causes of this fever can be best studied, however, by giving as a concrete case the Tourah epidemic, which is so instructive that it should never be forgotten by prison-administrators in Oriental countries. They are : (1) overcrowding, (2) deficient ventilation, (3) uncleanliness, (4) faulty conservancy arrangements, (5) insufficient diet for the work required.

On March 31, 1886, some of the convicts working at the quarries attempted to escape ; two of them were shot by the sentries, others were wounded, and the ringleaders were punished on the following day. This occurrence no doubt

had a distinctly depressing effect on the general body of convicts, and prepared them for the virulent epidemic which broke out early in April.

(1) Overcrowding was well exemplified in the dormitories in which the convicts were confined for twelve hours out of the twenty-four. I carefully measured the prison-cells, and found that the average official space was 23 superficial and 301 cubic feet for each prisoner. This was based upon the assumption that the cells would only be occupied by 648 men, whereas, for at least six months before the epidemic began, the convicts numbered over 900, reaching their maximum figure (1,024) in March. Both the superficial and cubic space were thus reduced for some months to a dangerously low figure. In consequence of this epidemic, a commission was appointed to inspect the gaols of Lower Egypt, and it was ordained that every prisoner must have in future 40 superficial and 600 cubic feet.

(2) Only one of the four rows of cells had outside windows ; the other three rows got light and ventilation from passages which had no roof-openings. The cells were surrounded by high boundary-walls of the prison, which kept out the exhilarating air of the desert. The cells and corridors were whitewashed and apparently clean when empty, but a disgusting human odour prevailed everywhere, especially in the corners. There were no inlets for fresh air in the cells ; the one door shut very tightly, and the windows and roof-openings were far too small for satisfactory outlets. The air was little changed by day and became extremely vitiated at night, the cells being occupied from about 6 p.m. to 6 a.m.

Mr. H. Milton, who was then superintending the stamping out of this epidemic, and I took the opportunity of examining one of the cells at 5 a.m. so as to see it at its worst. A horrible stench greeted us as we advanced within ten yards of the entrance door to the corridors, and in one of the cells, where we found eighteen convicts, the smell was so great and the heat seemed so oppressive (though only 81° F.) that we could not remain there for more than ten minutes without feeling faint. In the middle of the cell was a pail perfectly full of solid faeces and urine, without earth or disinfectants, and there was much urine on the floor near the door, lying in large

puddles. The door of the cell was tightly shut, and an iron bar quite prevented exit. Many of the convicts had thickly-coated tongues, and one of them complained to us of the faecal odour from the pail, but his companions sat silently on their mats with true Oriental indifference. In the four walls of the cell I counted more than 1,000 nests of bugs, and I mention this because it has been suggested that contagion may possibly be carried by these insects. We examined other cells on the same occasion, but the one from which I have quoted was one of the best in the prison, because it was bounded on the north by a corridor from which we had already removed the roofing.

(3) I have said that the cells by day looked white and clean; but there was a lack of disinfectants for the cemented floors, and the mats and blankets were rolled up in the cells all day instead of being well aired. The prisoners, both healthy and sick, were very odorous, and were mostly begrimed with dirt and covered with vermin. They were chained in couples by leg-irons four feet long, with heavy links. Many of them stated that they had not washed their bodies for years, and this seemed quite possible, for no water-supply existed within the prison, none was brought in for washing purposes, and the convicts were never marched down to the Nile until we suggested it. We started a bathroom, which was a great success; the sick men at once began to beg for baths, and lice disappeared from all the patients in less than ten days. Twenty-five wheel-barrows full of dirt and rubbish were taken out of the prison on the first day of our reforms.

(4) I have already referred to the conservancy arrangements, which consisted of a zinc pail for urine, which was obviously insufficient, as in every cell which we visited in the early morning there was urine lying on the floor. A similar pail on the floor of the cell provided drinking water for the night. During the day out-door pails were provided on the dry-earth system.

(5) The convicts in the quarries worked for eight hours a day and had to supply 530 tons of stone every day except Friday; but those supposed to be healthy looked so ill and anaemic, with coated tongues and haggard faces, that we succeeded in getting their work reduced for a time from eight

to three hours daily. On examining the diet we found that they had no meat, a deficient amount of vegetables and fat, and an excessive quantity of bread. The quality of the bread was, therefore, all important. To the naked eye it was evident that it had been insufficiently kneaded and baked, and that it was adulterated with some vegetable substance, while microscopic examination showed that it contained mineral particles and an appreciable amount of straw and bran. The analyst also reported that the flour was of mixed varieties, and was deficient in nutritive gluten. We temporarily increased the diet of the healthy by adding four ounces of rice, sixteen ounces of vegetables, and five ounces of meat per day.

CONTAGION.

Doctors and nurses practically living with the sick and saturated all day in the typhus-atmosphere, as was often the case in the Russo-Turkish war (1878), are extremely liable to be infected, but European colleagues in Egypt have so far escaped, perhaps because they are few in number, and do not live near the sick. I have, however, treated two young Egyptian doctors who were in charge of typhus-outbreaks near Cairo, and I have notes of a sixth-year's student who caught typhus in May, 1894 : there had been no cases at Kasr-el-Ainy for weeks, but I found that he had been visiting a friend ill with typhus fifteen days before his own symptoms began.

I have already referred to the occasional spread of the disease to hospital orderlies. One of them caught typhus, apparently from some cases he had been nursing at Kasr-el-Ainy, in June 1894, and was transferred to the hospital tents at Abbassiyeh. After his convalescence he returned to Kasr-el-Ainy, and caught the disease a second time in the following May, from a patient living in his own house. His second attack lasted fourteen days, and was as severe as the former illness for which I also treated him. This is the only instance of which I know of a second attack of this fever in Egypt.

Except in war-time, typhus is not by any means so contagious as some other fevers (influenza, dengue, measles) ; and though there were more than 500 sick among the Tourah convicts, I calculate that only 9 per cent. of them contracted typhus. Moreover, none of the prison officials caught typhus

during this epidemic, though many of them succumbed to relapsing fever.

VARIETIES.

The most common variety met with is the adynamic, with great muscular and cardiac prostration, involuntary evacuations, and a tendency to collapse. In better-class patients I have met with the nervous type ("brain fever") in which the rash is dark, copious and petechial, and nervous symptoms predominate. In the medical student the temperature fell on the evening of the sixteenth day, but five days later went up again above 40° C. (104° F.) on account of double parotid buboes which had to be lanced. In his case delirium and mental weakness continued until he left the hospital on the 38th day.

SYMPTOMS AND COURSE.

I have seen the *eruption* appear as early as the third day, but more usually it comes on the fifth or sixth. If by the end of the seventh day there is no dusky-red mottling on the face or trunk of a light-coloured patient, the diagnosis of typhus cannot be maintained. I have seen the typical mottling, maculæ and petechiæ on skins of all colours from the white Circassian, Greek or Syrian to the light-brown Nubian. Junior students seldom discover the rash for themselves when it first appears, partly because they do not search carefully enough all over the body, and partly because they are misled by the bites of mosquitoes and fleas. No eruption of any kind can be seen in negroes or dark-brown men, and therefore it is of the highest importance to be able to diagnose typhus without this symptom. The signs upon which I am accustomed to rely are a history of a few days' fever, epistaxis, injected conjunctivæ, slightly-contracted pupils, a dry tongue, a slight musty odour from the mouth, a feeble first sound of the heart, and a general air of prostration of mind and body. In severe attacks the rash becomes more and more marked, and in fatal cases the petechiæ seem to take on early post-mortem staining, so that they are often more apparent after death than during life.

The *temperature* behaves as in Europe; in severe cases the fever rises to $40\cdot5^{\circ}$ C. (105° F.) or above it during the first week, while a temperature of 41° in the first week is a bad

sign. In favourable cases the temperature falls on the fourteenth day, and then remains below normal for about ten days. Occasionally the temperature falls on any other day between the tenth and sixteenth. As a matter of prognosis it may be remembered that a patient who is still alive on the fifteenth day is not likely to die of typhus, though he may of course die of some complication later. Perspiration during the fever is usually only present in moribund patients, and in a few of them I have noticed that the sweat leaves a white crystalline efflorescence upon the eyelids and face. Deafness is an early symptom, and the patient, who from the beginning seems dull and stupid, gradually lies more and more like a log in bed, until in the second week coma, low muttering delirium, and retention of urine appear. The delirium is seldom busy or maniacal, though the patient sometimes becomes excited when shouted at, and may even get out of bed without apparent reason. At the end of the first week, when the mental condition is already blunted, a man hesitates to protrude his tongue, and later on forgets to retract it until he is reminded ; but in the comatose state the tongue lies in the floor of his mouth curled up, and it is only by seeing occasional tremors pass through it that you know the patient is trying to obey the invitation to put it out. Sometimes he is able to advance it as far as his teeth. The tongue is always dry from the beginning, and gradually becomes more dry and more brown until it is crusted ; in dying patients there is a moist, foul coating outside a black, stinking crust. The feeling of thirst seems overcome by stupor, but all except the quite comatose drink greedily of any liquid offered to them. Vomiting and hæmatemesis I have only seen in one patient, on the 21st day (Case 1).

The characteristic *odour* can be lessened by giving each patient plenty of cubic space, or, what is better still, treating him in the open air. The smell is worth studying, for I have often been able to diagnose doubtful cases by it. It has been compared with many offensive odours, but it seems to me to be most like a cupboard full of well-blacked boots. During the Tourah epidemic we were obliged to expose our clothes and our clinical notes to the sun for many hours before we could get rid of the smell.

Hypostatic congestion is such a common occurrence that it is rather a symptom than a complication, and is therefore useful for diagnosis in the Soudanese. It begins towards the end of the first week, and becomes more apparent till the end of the illness, and is usually without cough and without expectoration. Although at least three-fourths of the cases have contracted pupils, my experience is, that the "pin-hole pupil" of the books is rare.

I have never seen or heard of any true *relapse* during typhus in Egypt.

The *mortality* varies with the conditions under which the patients are treated; for instance, the convicts at Tourah were dying at the rate of 80 per cent., but the mortality fell to 50 per cent. (which is still enormously high), directly we supplied the sick with unlimited cubic space. There is no acute disease which lends itself more easily to open-air treatment.

COMPLICATIONS.

True pneumonia is very rare, and I have never seen gangrene of the lung, but hypostatic congestion, as I have said, is present more or less in every case, and bronchitis may occur in about 10 per cent. Bed-sores, as in other diseases, depend chiefly on the quality of the nursing, but they are extremely prone to occur during this fever on the sacrum or hip; yet I have seen some satisfactory cures in spite of enormous bed-sores occurring before admission to hospital. Buboës are most common in the parotid gland, and occasionally occur in the submaxillary; they are formed with great rapidity and are ushered in by considerable tension, pain and tenderness, so that the patient is unable to open the mouth or protrude the tongue; they may come at any time after the tenth day. Jaundice is extremely rare, but I have seen two cases which died respectively on the seventh and eighth days. Among the complications which I have never seen are: gangrene of the extremities, suppuration of joints, erysipelas, and phlebitis. Several patients have been brought to the hospital suffering from mania during convalescence, and I have seen a good many convalescents who went through the disease safely at their homes without medical attendance, and had to be admitted for debility later. Pregnant women miscarry and often die.

Although constipation is one of the symptoms of the febrile period, diarrhoea and dysentery often appear when the patient is thought to be convalescent, so that it is important to protect him from chills and to regulate his diet to a certain extent. The only concurrent disease of great importance is relapsing fever, which sometimes comes on during a mixed epidemic after the attack of typhus. The following abridged notes will illustrate these rare sequelæ :

Case 1. Typhus, Hæmatemesis, Death from Dysentery on the 27th day.—A fair Egyptian carpenter, aged 30, was first seen on the 7th day, when he had a well-marked eruption on his belly, chest and arms ; the tongue was very dry and red, the conjunctivæ were injected, and the bowels were constipated. His temperature was only 38° , but the pulse-rate was 120, and respiration 30, with slight cough. On the 10th day his temperature was 39.2° C. and had not been higher ; pulse 132, respiration 24 ; the eruption was fading ; the tongue was dry and brown, but clean. On the 14th day the temperature had fallen to 37.5° C. ; pulse, 120 ; the eruption was very faint, and he said he was quite well, and was very anxious to get out of the typhus-ward, where all his neighbours were comatose. On the 19th day he felt strong, and asked to be shaved. On the 20th day he had diarrhoea, and on the following day this became dysenteric ; he vomited blood ; the tongue was rough, very dry, and reddish-brown (temperature 40.1° , pulse 132) ; he was quite prostrate. On the 24th day his temperature was 37.5° ; patient was sensible, but was passing many motions unconsciously ; these were brown, liquid, and bloody with mucus ; his pulse-rate was 144, and he was much emaciated. On the 27th day he died at noon. I examined the body two hours afterwards, and found none of the ordinary signs of typhus. The blood was clotted normally ; the heart looked healthy, and contained firm clot ; there were hypostatic congestion of lungs, and congested liver, but spleen, kidneys and small intestines were normal. The large intestine was thickened and contracted, especially the rectum, with much recent congestion, and great prominence of the solitary glands of the descending colon and rectum, but no ulcers.

Case 2. Typhus ; Death from Dysentery on the 38th day.—A dark-brown Egyptian, æt. 35, was admitted on the 5th day

of the disease ; on the 11th day the temperature reached its maximum of $39\cdot 4^{\circ}$. The pulse-rate was 120 ; the tongue was dry and brown ; and stupor had existed since the previous day. On the 13th day the temperature fell to $36\cdot 6^{\circ}$, and on the 14th the pulse-rate was 102, the tongue was dry and red, and stupor continued ; minute black petechiæ were present on the trunk. On the 21st day the temperature was normal, after having been sub-normal for a week ; the tongue was clean and moist, and the patient had quite regained consciousness, and felt hungry. On the 27th day dysenteric diarrhoea first began, with 20 motions ; there was tenesmus, and mucus and blood appeared in the stools. The dysentery continued unchecked till death on the 38th day, in spite of careful diet, ipecacuanha, bismuth, opium, sulphate of copper, sulphuric acid, simaruba, &c. (This patient was under my care before I knew the value of large enemata in dysentery.) *Post-mortem* (six hours after death) : There was found much emaciation, but no bed-sores ; the muscles were red and healthy ; there were no ecchymoses. The blood was clotted, but was rather dark in colour. The lower halves of the lungs were oedematous, with slight hypostatic congestion ; the upper halves were partly collapsed and airless. Liver and kidneys were congested, heart and spleen normal ; the mesenteric glands were much enlarged, and there was pink congestion everywhere in the small intestine, but no ulcers ; the solitary glands of the great intestine were very prominent, with many small dysenteric ulcers ; there were white patches all through the rectum, and one large ecchymosis.

Case 3. Typhus ; Dysentery on 36th day ; Recovery.—A white Turkish carpenter, æt. 40, was admitted on the 6th day, with temperature 39°C . On the 7th day his temperature was $38\cdot 5^{\circ}$; and the pulse-rate was 120. The conjunctivæ were injected, and he said that he had pain everywhere. His tongue was very dry, and there had been constipation for the last three days. A very typical eruption existed on the axillæ, belly, and back. The lungs were resonant ; there was slight cough. Liver and spleen were not enlarged or tender. On the 11th day the eruption was still clearly seen ; the mind had been stupid since the previous day. On the 15th day his temperature was 36° ; the eruption was fading. He was

stupid ; the pupils were small, and there was a bed-sore beginning on the sacrum. On the 25th day he was sleepless at night, but otherwise well ; he had had some boils on the forehead. On the 32nd day he felt quite well, but on the 33rd said that the sun in the garden had affected him that day (June). His temperature was 39.7° , and his pulse 150. The tongue was clean and moist, and there was no diarrhoea or pain. He was slightly giddy, but slept well. On the 34th day his temperature was 39.6° (a.m.), and his pulse 150 ; his tongue was very dry, and he complained of thirst and headache (sun-fever ?). On the 36th day his temperature was 36.5° , and his pulse 126 ; he passed eight dysenteric motions. On the 39th day he had had 25 stools. His temperature was 37° C. The dysentery then gradually improved, and he left the hospital on the 64th day.

Case 4. Typhus ; Parotitis ; Relapsing Fever ; Recovery.—A light-brown mason was brought to the hospital on the fifth day of his illness with a temperature of 38.2° (a.m.), and a pulse-rate of 90. No eruption was visible ; there was headache, and the tongue was dry and furred. For the next five days his fever varied from 39.5° to 40° , and he grew steadily worse, but remained conscious. On the 11th day his temperature was 40° , and his pulse 126 ; he suffered from headache, and groaned in his delirium ; and when roused with difficulty, he said that he had pain all over him. The tongue was dry, red, and fissured ; the conjunctivæ were injected, and the eruption was well seen on the chest. He used to forget to shut his mouth after opening it. The spleen and liver were distinctly felt below the ribs. On the 13th day his temperature was 39° , and his pulse 120 ; he appeared worse than on the previous day. There was inflammation of the parotid gland, but no pus in it. On the 20th day his temperature had been normal for five days ; his pulse was 84, and he said that he was quite well, and seemed so. On the 25th day he asked leave to move his bed away from the neighbouring patient, who was dying of typhus and smelt horribly. On the 26th day his temperature was 40° , and his pulse 108, respirations 30 ; he complained of thirst, but his tongue was moist. He had had a rigor, and said that he caught cold on that morning from sleeping in a draught from the window. On the 27th day his temperature was 38.5° , and

his pulse 138 ; his tongue was moist, red, and rough ; there was no cough and no pneumonia. On the 28th day his temperature was $39\cdot 3^{\circ}$ (a.m.), $39\cdot 7^{\circ}$ p.m. ; his tongue was clean, and he had no pain anywhere, but his *blood contained very distinct spirochaætae*. He was transferred to another ward, containing relapsing-fever patients. On the 30th day his temperature was $40\cdot 2^{\circ}$ (a.m.), and his pulse 120 ; his tongue was very large, red, and rough ; he had no pains. On the 33rd day (temperature $38\cdot 4^{\circ}$) he was sweating much, and his tongue was better. After the 35th day his temperature remained normal till he was discharged cured on the 58th day. This case was specially interesting because I hesitated as to whether it was typhus or relapsing fever when he was first admitted, and in fact until the typhus-eruption appeared.

Case 5. Typhus ; Bronchitis ; Relapsing Fever with Relapse ; Recovery.—An Egyptian convict, delirious, with a typical eruption, was admitted on what was said to be the 5th day of his illness. His temperature was 40° , and his pulse 124° . On the 6th day his tongue was very dry ; his temperature was $40\cdot 2^{\circ}$, and he had cough, with white bronchitic sputa and impaired percussion-resonance at both bases, but good breath-sounds everywhere. On the 9th day his temperature was 39° (a.m.), and his pulse 128 ; respiration 40 ; the tongue was dry and glazed. *No spirochaætae were found in the blood.* On the 13th day the patient was conscious, and said that he was doing well. The eruption was still present, and his temperature was 39° . On the 15th day his temperature was $37\cdot 5^{\circ}$; his tongue was moist, and he had much cough. On the 17th day his temperature was 37° , and he was much better and said he was quite well. On the 23rd day his temperature was $37\cdot 3^{\circ}$ (a.m.), pulse 114 ; he had slight headache, but was sitting up. On the 28th day his temperature was $31\cdot 5^{\circ}$ (a.m.), pulse 138 ; he was giddy, and complained of pains everywhere, especially in the head. On the 31st day his temperature was $39\cdot 8^{\circ}$ (a.m.), and he was very giddy, the headache was worse ; his tongue was moist and pale, and his *blood contained spirochaætae*. On the 32nd day his temperature was 40° in the evening, but on the following morning it was only $35\cdot 7^{\circ}$ —a typical crisis. The temperature then remained sub-normal for 9 days, but on the 43rd day he had a relapse ; his temperature reached $40\cdot 6^{\circ}$,

being the highest record during the whole illness. His pulse was 120 ; there were giddiness and headache again ; the tongue was moist and clean, the bowels were normal, and there was no cough. On the 47th day he had a second crisis of the relapsing fever ; his temperature fell from 39·2° to 36·1°, and then remained sub-normal and normal until the patient was discharged on the 63rd day.

MORBID ANATOMY.

I have notes of 17 cases of typhus-autopsies done by myself, without counting others which died of dysentery during convalescence from the typhus. The bodies were examined at periods varying from 3 to 23 hours after death, the average interval being 15 hours. But in spite of this precaution putrefaction had nearly always begun, though this was not noticeable in deaths on the same days from other diseases. Rigor mortis was absent or ill-developed in all cases. An *eruption* was present on many corpses, generally in the form of petechiae upon the dependent parts of the trunk and limbs, and here there was also much greater and earlier discolouration than in other diseases. I have generally been able, while doing these typhus-autopsies, to compare the different structures with other corpses in the post-mortem room. The *muscles* were dark-red or brownish and very flabby, and my notes speak of two well-marked ecchymoses stretching from the umbilicus to the pubes in the rectus muscle. The *heart* in more than half the cases was soft, very flabby, and contained no clot, but in three cases the muscular tissue was apparently normal, and in two others the heart contained a little soft black clot. In practically every case, if the patient dies at the end of the second or beginning of the third week, the blood is scanty, very dark-coloured and perfectly liquid, without any trace of clot. I should like to lay some stress upon this, for it may help to diagnose after death a doubtful case of continued fever in a black patient.

The *bronchi* in my cases had their lining membranes coloured bright-red, and were partly filled with frothy, tenacious mucus. The *lungs* were never healthy ; at every autopsy there was much hypostatic congestion, so that the portions of lung most affected did not crepitate, but I have

only seen two cases in which large pieces of lung sank in water. The lower halves of both lungs, when cut open, were smooth and not granular, of chocolate colour, and emitted on pressure a dark-coloured serum, containing scarcely any air. Besides much oedema, there was generally emphysema in the upper lobes, but sometimes these also were apparently collapsed and airless, so that it was difficult to understand how the individual could have breathed. In several cases I have seen well-marked petechiae on the pleural surfaces. The *liver* was only normal in one case, and in nearly all others there was much congestion. I saw an instance of Frerich's "emphysema of the liver," in which pieces of the organ floated in water, though the autopsy took place as soon as possible after death. The external colour was a greenish-brown, and on cutting it open, the lobules were seen to be very distinct, and the liver-substance was spongy and filled with air, crepitating on pressure like a lung and emitting a little oedematous fluid full of air-bubbles.

The *spleen* was normal in one-third of my cases, and congested and double its weight in most others.

The *kidneys* were congested deeply in three-fourths of the bodies, and one of them had a large ecchymosis.

The *cerebral membranes* showed slight congestion, and were fairly adherent, though they could be stripped off without removing brain-substance. The fluid in the lateral ventricles was transparent and colourless, and never seemed to exceed half a drachm. Upon cutting the white brain-substance, an unusual number of bloody points was nearly always seen.

DIAGNOSIS.

I have never seen any case of typhus which ought to have been confounded with enteric, nor one of enteric which could be mistaken for typhus by anyone conversant with the two diseases; but I may just mention that enteric is distinctly rare among Egyptians, though, when it does occur, diarrhoea is not necessarily one of the prominent symptoms. Measles presents a characteristic history of catarrh, and its victims are usually children, who enjoy a comparative immunity from typhus. Pernicious malarial fever could easily be mistaken for typhus in the Soudan; it must be recognised by the presence of

haematozoa in the blood, by the absence of the history of over-crowding, by former attacks, by the season of the year, and by the specific action of quinine. The three diseases from which it may be difficult to diagnose typhus are : pneumonia, relapsing fever, and plague. Pneumonia in a negro will not present injected conjunctivæ, and will have earlier and more definite physical signs in the chest than typhus, and the ratio of the respiration to the pulse will also be higher in pneumonia.

Typical cases of relapsing fever and typhus are widely different, but protracted and severe cases of relapsing fever approaching coma are very difficult to distinguish for a few days from mild cases of typhus, when appearing in negroes. In relapsing fever, the onset and rigors are more sudden ; the headache, giddiness, and bone-pains are more severe ; high fever occurs earlier ; eruption is absent ; jaundice, vomiting and tenderness of the upper abdomen are more likely to be present ; the pupils are less contracted ; and the odour is distinctly less offensive. In ordinary cases the moist, comparatively clean tongue of relapsing fever is sufficient to dispel doubt, but I have seen patients brought semi-comatose to the hospital with a dry, brown, cracked tongue very suggestive of typhus ; yet even these tongues can be protruded at will in relapsing fever instead of being curled up in the floor of the mouth as in typhus. The crisis, sweating and sub-normal defervescence about the 7th day complete the diagnosis of relapsing fever, even in cases where the blood cannot be examined for the spirillum. Clot Bey, when visiting a hospital in London containing typhus-cases, said, when he saw the parotid buboes, "In Egypt we should call that disease plague." In ordinary bubonic plague, the bubo is much more likely to be in the inguinal or femoral region than in the parotid gland ; it is one of the first symptoms noted, whereas typhus-buboes never occur till the second week ; and bacteriological examination will show the existence of the plague-bacillus. Pneumonic plague does not usually resemble typhus, but in cases of doubt the plague-bacillus will be found in the sputa.

PROGNOSIS.

This depends greatly on the age, for under twenty years only 10 per cent. are likely to die, whereas after 40 years the

prognosis is never good. I have already shown that in unsatisfactory conditions the death-rate may mount up as high as 70 per cent. When death takes place, it results from heart-failure or from nervous symptoms deepening into coma, or from some complication.

TREATMENT.

Too much stress cannot be laid upon the importance of unlimited fresh air; in country districts cases can be best treated in open tents or huts, with only sufficient roof to protect from the sun by day and from damp by night. The patient should be allowed as many blankets as he likes, and should be given unlimited drinks of water, which he always desires, though he is sometimes too delirious to ask for them. In addition to a plentiful supply of milk and beef-tea, all patients above the age of thirty, and dangerously-ill cases under that age, will be the better for stimulants, such as brandy, carbonate of ammonium and strong coffee. Headache requires an ice-bag and aperients, while sponging the body and the use of the catheter, if there is retention of urine, must not be forgotten. Buboes require to be opened early, and sleeplessness or maniacal delirium will want treating with bromide of potassium and chloral. So far as is possible, the lips, tongue, and throat should be kept clean, to try and obviate the occurrence of parotid buboes. During convalescence the diet must be restricted until all risk of diarrhoea is over.

"A patient with typhus is like a ship in a storm; neither the physician nor the pilot can quell the storm, but by tact, knowledge and able assistance, they may save the ship."—(Murchison.)

PREVENTION.

Until we know and have studied the microbic cause of this disease we must confine ourselves to removing the conditions in which typhus prospers, all of which spring from poverty, ignorance, laziness and helplessness. By waging war against uncleanliness, overcrowding, ill-ventilation, and the necessary effluvia arising from these three, Egypt will be able to rid herself of typhus, just as almost all Europe has done. In the meantime every sporadic case must be notified and isolated

promptly ; the hut or prison from which he came must be disinfected ; and his companions treated compulsorily to an abundance of fresh air. A Sheikh who conceals cases of "fever" in his house or in his hamlet is hardly fit to remain as head of the village ! All crowded gatherings of human beings, such as schools, hospitals, prisons, barracks and workmen's dwellings, should be regularly inspected to see that ample cubic space and ventilation are provided.

REFERENCES.

- Clot Bey : *De la Peste observée en Egypte*, Paris, 1840, p. 148.
Pruner : *Krankheiten des Orient's*, Erlangen, 1847; *Topographie Médicale du Caire*, Munich, 1847.
Griesinger : *Gesammelte Abhandlungen*, Berlin, 1872, Vol. II.
Sandwith : "Typhus and Relapsing Fever in Egypt," *St. Thomas's Hospital Reports*, London, Vol. XVI.
Engel Bey : *Relevé des Maladies Infectieuses de 1896 à 1900*. Cairo.
-

SOME OBSERVATIONS ON CARCINOMA OF THE COLON.

By H. S. CLOGG, M.S. (LOND.), F.R.C.S. (ENGL.).

Assistant Surgeon to Charing Cross Hospital; Surgeon to Out-Patients, Evelina Children's Hospital.

THE substance of this paper is based upon an analysis of 25 consecutive cases of carcinoma occurring in different parts of the colon. The number of cases is small, I confess, and my only plea for basing a paper upon them is the fact that the cases are consecutive and not specially chosen to illustrate a point, and also that one or two features which I wish to emphasise occurred with such regularity that I have thought it might be useful to record them. The majority of the cases were in the wards of Charing Cross Hospital during my tenure of office as surgical registrar, and I should like to express my gratitude to the surgeons of the hospital for their kind permission to make use of them. The remainder of the patients I had an opportunity of seeing elsewhere during one phase or other in the course of the disease. Although anatomists draw a distinction between the sigmoid flexure, colon, and upper rectum, nevertheless for clinical purposes it is advisable to regard them as one. I have included, therefore, growths in the upper rectum in this series.

The situations of the growths were as follows:—Cæcal region, eight cases; hepatic region, three cases; splenic region, six cases; sigmoid flexure and upper rectum (conveniently called "recto-sigmoid" region), eight cases. I speak of *regions* in preference to saying "a growth of the cæcum," or "a growth of the hepatic flexure," &c., because the growths are often not limited to the cæcum, for instance, but involve the ascending colon (sometimes more of this than of the cæcum is involved), and a tumour is often found, not exactly at the flexures, but an inch or two to one or other side.

The characters of the growths are widely different, and two distinct types may be recognised. The first type involves some 3-4 inches of bowel; it is soft, friable, extensively-ulcerated,

and does not narrow the lumen of the gut materially. The second type involves, as a rule, a smaller tract of gut, the lumen of which is always more or less materially diminished by it. The former type is the one most frequently seen in the cæcal region, and not uncommonly in the hepatic; the latter type is the one to expect in the recto-sigmoid and splenic regions, and less commonly in the hepatic region.

SYMPTOMS AND DIAGNOSIS.

Carcinoma of the colon is essentially a chronic malady, but when the patient first comes under the supervision of the surgeon, acute or sub-acute symptoms are frequently present. In this series, in no less than 16 cases was this so: in 10 cases complete obstruction was present, and in 6 suppuration had occurred. It is often stated that acute obstruction may be the earliest symptoms of carcinoma of the bowel. I regard this occurrence, however, merely as an acute manifestation of a chronic disease, the symptoms of which will be found to have existed for some time, if only sufficient pains be taken to elicit an account of them. Setting aside for the moment the six cases complicated by suppuration, since they will be referred to later, the previous history of the ten cases of complete obstruction is of some importance. In two of these cases the diagnosis was so obvious that they may be left out of account. In the remaining eight, every patient, when first seen, assigned to his illness only a few days' duration. On a little more careful enquiry, however, I was able in every instance to ascertain that intestinal symptoms had in reality been in existence for periods of two or three months. These symptoms were in every case, pain, sluggish action of the bowels, deterioration in health, and some loss of flesh, sufficient to be actually appreciated by the patient. For these symptoms to be of value, they must obviously be constant and progressive. This was so in each case. In two cases indeed these symptoms were so slight that they were not thought of much account by the patient. In six cases, however, the symptoms were severe enough to make the patient seek medical advice, and I venture to think that the correct diagnosis should have been strongly suspected before the onset of the acute symptoms. Failure to recognise the disease early is all the more lamentable

because in four cases, as shown by necropsy, the growths were removable.

The pain took the form of occasional attacks of colic—slight it is true, but it would have been possible, I think, to have excluded colic arising from disease in other organs. If one tries to consider the causes of intestinal colic, repeated and extending over some three months, in a person who has previously shown no evidence of abdominal disease, supposing that one can exclude intestinal stenosis, there remain very few other causes than a new growth. If stenosis be suspected, it is perfectly justifiable to presume carcinoma to be present.

The second symptom—constipation—frequently necessitated a very careful inquiry. Patients cannot be brought to believe that a *little* constipation is of any importance. They will say that they have been taking aperients lately, thinking that it would do them good if they had “a good clear-out,” although they will not confess to any constipation. I should regard this as a most important sign, for I think it most unlikely that a person whose bowels have previously been acting freely should think the bowel at fault, unless his attention were called to it by some symptom such as abdominal discomfort or constipation. Every case of slight constipation more or less suddenly developed in a person who is taking his usual quantity and quality of food should be accounted for. Another point, perhaps, of some moment is that a patient will sometimes state that his motions have diminished in size. This piece of information was volunteered in three cases of recto-sigmoid growths.

In the ten patients who, when first seen, were suffering from complete obstruction, it was not possible in any case to determine where the obstruction was. In four cases it was found to be in the splenic, and in two in the hepatic region. In these six cases both sides of the belly were equally blown out, peristalsis was visible everywhere, and coils were seen in the position of the entire length of the colon; in fact, the abdomen presented an appearance which is figured in books as conclusive of obstruction in the rectum or sigmoid. I only mention this to warn against making an incision in the left iliac region in any case where a tumour has not been felt; this is hardly ever possible.

In this connection a word may be said about the diagnostic value of visible peristalsis. Evident intestinal coils are by some held as diagnostic of bowel-obstruction. I have seen this phenomenon most distinctly three times in pyloric obstruction (it was clearly not gastric peristalsis), twice in cholelithiasis associated with colic, and once in the abdominal crises of locomotor ataxy. These examples are given to show the importance of not assuming that every case of "colicky" attacks with visible peristalsis means intestinal obstruction. The abdominal parietes in these patients were thin; it would probably be of far more diagnostic import in a well-covered abdomen.

I do not profess to have mentioned any new symptoms of intestinal carcinoma, but I wish to emphasise the importance of any continued pain in the abdomen, of any slight constipation (which must always be most carefully enquired into, as patients often do not know whether it exists or not), associated with any decline of health, in persons with no previous abdominal trouble, whose bowels have previously been regular, and whose appetite and digestion appear to be in good order. It will be easier to exclude other diseases, I think, than disease of the colon, and this should be most carefully done. I feel convinced that, if these symptoms be present, an examination under anaesthesia should be made, and in many cases an exploratory laparotomy performed, if a tumour be not palpable under anaesthesia. Examination under anaesthesia will in the majority of cases tell us nothing, although it revealed a tumour in three cases in this series, once in the sigmoid, once in the splenic, and once in the hepatic regions. These remarks so far apply of course to carcinoma elsewhere than in the caecal region. In the latter region it is well known that obstruction occurs with extreme rarity, if indeed it occurs at all. This fact is easily explained by the tendency of these growths to undergo extensive ulceration, but more so by the fluid nature of the intestinal contents in this region. If obstruction be absent, the colicky pain cannot occur, and we are at once deprived of our two characteristic symptoms.

Of the eight cases here alluded to, four were complicated by suppuration. This phenomenon will again be referred to, and I will merely say here that in no case was I able to obtain a history of any local symptoms prior to the onset of suppuration.

The four uncomplicated cases came under observation with a distinctly-palpable tumour, which from its size might have been growing for some months. In one case pain was entirely absent, in three cases a slight pain had been noticed for a week or two—evidently a much shorter time than the growth had been present. In six cases most marked deterioration in health had been present, and the patients had lost weight at the rate of a stone a month. In the other two cases I was unable to obtain a trustworthy account. These facts serve to show that in growths affecting the cæcal region local pain or discomfort is long deferred, while the effect on the general health is most marked. The chief lesson to be drawn is never to forget the cæcal region when endeavouring to ascertain the cause of progressive and rapid loss of weight without other symptoms. If the cause be a cæcal carcinoma, a tumour will most probably be detected when the patient presents himself for examination.

Of two other symptoms which are commonly vaunted as being common in carcinoma of the colon, viz.: alternating constipation and diarrhoea, and the passage of blood *per rectum*, I can only say that diarrhoea was not present in one of these twenty-five cases, and that rectal haemorrhage was only noticed twice. In one case of cæcal carcinoma one pint of altered blood was said to have been passed *per rectum*; and in a case of recto-sigmoid carcinoma small quantities of blood were passed.

As accessory means of diagnosis, the passage of rectal bougies and copious injections are frequently recommended. I have never seen this done for diagnostic purposes. In one case in this series in which the growth ulcerated into the peritoneum, symptoms of peritonitis appeared after the giving of a simple soap-enema and were directly attributed to this. Hence I should be very loath to recommend such treatment. The passage of a bougie or seizing the bowel with forceps and dragging it down to the reach of the finger might easily have the same result.

DISSEMINATION BY THE BLOOD AND LYMPH.

It is generally stated that in colon-carcinoma the lymph-glands are commonly only involved late in the course of the disease, and that the dissemination by the blood-stream, as a

rule, occurs earlier than by the lymphatic circulation. The terms "early" and "late" are at the best only comparative, and cannot be considered of much clinical value. Moreover, it is a very difficult point to determine what is an "early" carcinoma of the colon, as it is well known that the symptoms are so very obscure. Again, it is only reasonable to expect glandular involvement in a well-advanced carcinoma in any organ of the body. Of these twenty-five cases, I have been able to examine the glands (either removed at operation or *post mortem*) in sixteen. In thirteen cases I have found malignant infiltration. In some of these glands a very prolonged search was necessary. It might be urged that all these cases were well-advanced ones. I must confess to being unable to say whether they were or not. It would seem to be of far more importance to know whether it is usual to have glandular involvement present when the growth has been in existence long enough to give rise to symptoms sufficient to cause the patient to seek treatment. In four of the thirteen cases the patients were admitted to hospital suffering from acute intestinal obstruction : on carefully questioning these patients the earliest symptoms were found to have been noticed in each case less than three months previous to their admission. In three other cases the earliest symptoms had been present less than four months, in two less than five months, in two less than six months, in one seven months, and in one twelve months before their admissions. Of the three cases in which I was unable to find any epithelial infiltration of the glands, in only one case was a post-mortem examination made and a complete search possible. In the other two cases the growths were excised in each case, together with several large inflamed glands. Both these patients are now enjoying the best of health, at intervals of eighteen and twenty months after the operation. Yet it is by no means safe to say that their glands are uninvolved. I mean by the earliest symptom in these cases, the slightest abdominal pain or discomfort, and the earliest onset of constipation.

From these statistics it appears that it is the usual thing to have glands already infiltrated when the symptoms are severe enough to bring patients for treatment.

In eleven cases a post-mortem examination was made, and

in three only of these was the liver infiltrated. The duration of symptoms in these three was four, five, and six months respectively. Many of the other cases have been followed up (an attempt has been made to follow all, but trustworthy information cannot be obtained in every case), and in no case has any clinical sign or symptom of liver-involvement been evident. In one of these cases the initial symptom was five years ago (this patient has had a glandular recurrence removed two years ago); in one case, 20 months; in one, 18 months; and in one the duration of life after the initial symptom was 16 months. The remaining cases are all less than 15 months.

The question of lymphatic and visceral involvement is of prime importance when a radical extirpation of the disease is contemplated. If we are to expect dissemination by the blood-channels to have already taken place when the patient presents himself for treatment, it is obviously useless to remove the primary disease. These statistics, small as they are, are yet from consecutive cases, and not chosen to prove a point; they do not bear out the usually-accepted idea that blood-dissemination is the great barrier to removal of malignant neoplasms of the colon. On the other hand, the statistics of the glandular involvement show how very important it is to remove the nearest chain of lymphatic glands. The operation on every case of carcinoma consists not only in excising the primary growth, but also, at the least, the nearest chain of lymphatic glands and the lymphatic tract between the two, where possible. In regions where the anatomical relations of parts allow of this, the results are, and always will be, more perfect than where the glands are inaccessible or at the best can only be removed piece-meal, leaving behind, almost certainly, lymphatic vessels containing malignant epithelial cells. Before the radical operation can be performed it is essential to know the anatomical position of the vessels and glands bearing lymph from the growth, so that with the latter they can be removed in one piece. An incision into this broad expanse of malignant infiltration would almost certainly mean leaving disease behind.

Statistics of colectomy for carcinoma are mostly published with the idea of showing the immediate result of the operation, whilst statistics bearing upon an equally important point—the

complete eradication of the disease—are few and far between. From the cases published, however, we are able to learn one or two important points. In the first place, after a successful colectomy in which the patient has survived many months, it is almost the universal rule to have most marked improvement in the patient's health, with considerable gain in flesh and in strength consecutive to the operation. I am not including here cases in which obstruction, vomiting, or marked pain were present, for everyone knows how in these cases, after a simple colotomy, considerable improvement in the health often follows. Yet notwithstanding the temporary improvement in these cases of colectomy, we are informed in many cases that after many months—sometimes one or even two years—either local recurrence or visceral involvement terminated life. The first point to which I wish to call attention is the one of "local recurrence." It is very difficult to understand how, when the primary growth is removed with a margin on each side, a local recurrence can occur. A wide margin always seems to have been removed, judging from the length of intestine reported to have been resected. In the cases of early removal of malignant disease of the stomach it is well known that many recurrences *in loco* were observed, *i.e.* in the stomach-walls. The explanation of this, however, has been supplied by Cunéo in his well-known work on the subject. This observer has shown how, in the case of carcinoma of the stomach, the malignant infiltration spreads farther into the submucous tissue than is shown by the margin of induration, and columns or islets of epithelial cells may be seen in this tissue for a distance of 1—2 cm. from the supposed margin of growth. The same explanation, it might be thought, would serve to account for the local recurrence of a carcinoma of the colon. To try and determine the point, I have examined several portions of the bowel at the margin of the growth and at some little distance from the growth in many cases, and have not yet succeeded in demonstrating a spread of the growth in the colon similar to that which occurs in the stomach. The so-called local recurrence is, I am inclined to believe, a glandular recurrence; and if obstruction occurs, it is due to a secondary involvement of the bowel. In my series of cases I must confess to only being able to bring forward one instance in support of this

view, and one other case in which after excision of the cæcum, at the necropsy, eight days later, I was able to find malignant glands left behind. The three facts (1) that glandular involvement is the common thing, when the patients present themselves for treatment ; (2) that the growth does not tend to spread in the submucous tissue or other coats of the bowel, as in the case of the stomach ; and (3) that a wide margin has been allowed on either side of the growth, are I think very suggestive that the so-called recurrence is a continued growth in glands involved, but not removed, at the time of operation.

The second point which appears to me of great importance is the involvement of the liver some months after the operation. If the primary growth and the lymphatic glands be removed, and death occur late from visceral involvement without any recurrence elsewhere, it is fair to conclude that the viscera were involved at the time of operation. This being so, I can hardly conceive the possibility of marked improvement following colectomy in these cases, if hepatic infiltration be actually present at the time of operation. Having carefully perused the notes of many cases of carcinoma of the liver, I have found, almost without exception, that when once this viscus is involved, the tendency to rapid deterioration of health is the rule. This is well known in the case also of mammary carcinoma. I admit that if colotomy is performed upon a patient for obstruction, when it is known that the liver is involved, a temporary improvement will often follow ; but this improvement lasts only for a week or two, and not for some months or one or two years. That malignant epithelial cells can lie latent for months and years in lymphatic glands is well known in the case of the breast and tongue, and it seems most reasonable to conclude that a similar state of things may take place in the abdominal lymphatic glands. I venture to think that this is the explanation of the involvement of the liver in these cases of intestinal carcinoma. Cells have remained quiescent in the glands, and then, for some reason entirely unknown, their activity is renewed, dissemination occurs by the blood-paths, and death speedily terminates the case.

Feeling so convinced of the importance of removal of the nearest chain of lymphatic glands, I have taken every possible

opportunity of endeavouring to ascertain which glands should be removed in each favourite situation of carcinoma. In the three cases in which I was unable to find malignant deposits in the glands, some of these were yet found enlarged, evidently from septic infection. Should the disease in these cases have spread by the lymphatic circulation, it seems reasonable to conclude that the same chain of glands would have been involved, and I have made use of these cases for determining the point at issue. I have also made use of other cases in which either a "short circuit" or a colotomy was performed, the growth being irremovable, and a distinct series of enlarged glands was present; also two cases of localised ulceration of the cæcum and one of the sigmoid flexure which were associated with enlarged glands.

I observed the following points:—

1. In the cæcal region the glands involved were the so-called ileo-colic group, which are said to be three or four in number and to lie in the angle between the ileum and colon. These glands are more than three or four in number, and they have a wider anatomical distribution than simply in the angle between the ileum and colon. They form quite a chain, which runs for some distance along the ascending colon; and they also lie in the terminal part of the mesentery. In six consecutive cases they were seen lying on the inner side of the ascending colon, and in five they were found in the termination of the mesentery. In the sixth case the cæcum and ascending colon were removed with the lowest $1\frac{1}{2}$ inches of ileum; the patient is still in excellent health (eighteen months after the operation), so that no chance has been offered of examining the glands in the mesentery. In this case, owing to an abnormally-lying transverse colon, more bowel was removed than was intended. Perhaps this accounts for the good results.

2. In the region of the hepatic flexure I have only had the opportunity of examining two cases, and in each of these the glands involved were a distinct chain running for some distance along the lower border of the transverse colon.

3. In the region of the splenic flexure four cases have been observed, and in each case the glands involved were a chain running along the lower border of the transverse colon nearly to

its centre. In two cases the growth was just below the splenic flexure, and in each the same group of glands was involved.

4. In the region of the sigmoid colon and upper rectum eight cases were examined. The glands from this area of the colon are spread out in the mesentery ; from them the lymph-flow converges to a series of glands situated near the root of the mesentery (colic mesentery).

I have examined the glands which lie along the aorta and vena cava in several cases and never found them enlarged.

An attempt to remove these various groups of glands involves, of necessity, the sacrifice of more bowel than I think it is usually the custom to remove. With regard to this point I venture to make the following suggestions :—

1. In caecal growths some inches of ileum with its mesentery should be removed. In one case of excision of the caecum in which the patient unfortunately died eight days after the operation, I detected *post mortem* the glands in the termination of the mesentery full of cancer. The greater part of the ascending colon should also be removed, practically to the hepatic flexure.

2. In growths in the region of the hepatic flexure I should suggest the removal of the corresponding half of the transverse colon with as much of the mesentery as possible.

3. In the splenic region, including the growths just below and really in the upper part of the descending colon, the removal of the corresponding halves of the transverse colon and meso-colon should be practised.

4. In the recto-sigmoid growths I think practically the whole of the meso-sigmoid should be removed, and this means a sacrifice of nearly the whole loop of bowel. In many, probably in the majority of cases, this would entail the formation of an artificial anus, since it would be impossible to secure apposition of the cut ends of bowel. Should this be so, the lower end of the bowel had better be sewn up. In some cases it may be possible to leave some sigmoid colon, and after freeing this loop by division of the peritoneum (taking the greatest precautions to leave vessels uninjured) to draw it down and unite it to the rectum low down, through a perineal wound. This possibility depends entirely on the length, breadth, and attachment of the mesentery of this loop of bowel.

SUPPURATION IN CONNECTION WITH CARCINOMATOUS
GROWTHS OF THE COLON.

I wish first to mention this point as I feel it is not generally sufficiently emphasised. In no less than eight out of 25 of these cases (practically a third) suppuration occurred as a complication. In two cases general peritonitis resulted ; both these growths were in the recto-sigmoid region. Of the remaining six—in four the growth was in the cæcal region ; in one, in the sigmoid colon ; and in one, either in the splenic flexure or descending colon. It is only reasonable to expect that suppuration would be more likely to occur in the cæcal region, when we consider the foul, sloughy masses which these tumours form there. A further point of importance in connection with their comparative frequency in this region is that an abscess forms acutely or subacutely, and from this the patient will often date the commencement of his illness. Quite naturally appendicitis is diagnosed : in two of these four cases this was the diagnosis made. Obstruction in these cases is, as already said, absent, and the great frequency of appendicitis seems to banish all other possibilities. In both of these cases, however, on a little careful enquiry, it was perfectly clear that these acute symptoms were not the commencement of the trouble. Both patients had suffered most marked decline of health, and had lost flesh very rapidly prior to the acute symptoms. The only lesson to draw from this is always to make careful enquiries for any symptoms which have been present before the acute manifestations. In one case the kidney was thought to be at fault. The urine, however, in this case never showed anything suggesting renal trouble—by no means an infallible sign, I admit. This case did not come under observation until some months after a tender and rapidly-increasing tumour had been noticed ; and when seen, a large gaseous abscess had burst through the deeper layers of the abdominal wall and produced a diffuse superficial cellulitis. At this stage of the disease it was impossible to locate its origin, and only a very imperfect history could be obtained from the patient, who was suffering from septicæmia, to which he succumbed a few days after the evacuation of the abscess. In the fourth case of pericæcal suppuration, the quantity of pus was small (about

2 drachms) and its presence was not recognised. It ought perhaps to have been suspected, since, on the patient's admission to the hospital, the tumour was practically free from tenderness and was freely movable. In two or three weeks marked tenderness appeared, and the tumour became more or less fixed. In the remaining cases of suppuration, previous symptoms of intestinal carcinoma could be obtained with a little care. It is not as a rule a difficult matter to diagnose an abdominal abscess, and by excluding other organs it will generally be found fairly simple to determine its origin in the intestine. By paying careful attention to previous symptoms a correct diagnosis will, I think, be made in the majority of cases of suppuration in connection with carcinoma of the colon.

In the diagnosis of these abdominal abscesses, fever is not a marked sign, but a careful study of the temperature-chart is most important. It is quite the exception to have much rise of temperature, and even moderate fever is unusual. What is generally observed is an intermittent temperature, the highest point reached often not being above $99\cdot5^{\circ}$ F. This daily rise is continued, however, most regularly; and when we consider the age of these patients—usually over 40 years—and the fact that they are the subjects of some wasting disease, a slight and continued daily rise is of the most diagnostic import. Often occasional rises of temperature to 101° or 102° are observed. The pulse-frequency is of very little value.

The history of the onset of the local symptoms is most important. The acute onset characteristic of appendicitis is not as a rule noticed in these patients. Usually the symptoms are subacute throughout, and during the early days the patient may be able to get about and attend to his business; not, however, without some considerable abdominal discomfort. Superficial tenderness is absent; pain on deep pressure is complained of in varying degree. An ill-defined swelling forms. This can be handled quite freely without causing the patient any severe pain. The abdominal parietes are held very slightly, if at all, rigid. Fluctuation will hardly ever be obtained, unless the abscess be of large size. When these signs occur in a person of over 35 years, who on first and superficial enquiry assigns them as the onset of his illness, suppuration in connection with carcinoma of the bowel should at once be

thought of. A most exacting enquiry should then be made for any symptoms noticed during the past few months ; and should carcinoma be present, I venture to think that previous symptoms will hardly ever be lacking.

TREATMENT.

It goes without saying that growths should be renewed if possible with their lymphatic "drain," as I have briefly sketched above. Whether a growth be removable or not will only be told after the abdomen has been opened. The liver, of course, should, as far as possible, be palpated with the hand in the abdomen. If this organ be infected, no radical operation is possible, and the primary growth must be left alone. It is quite obvious that the liver may be extremely infiltrated, and yet that part of its surface which is accessible to palpation with the hand in the abdomen may present no changes. The extent of primary disease may, however, suggest to the operator that the liver is in all probability involved, and may deter him from further interference. The statistics which I have given above shew that the liver is comparatively rarely involved, and in every case in which the primary growth appears removable, however extensive and of whatever duration it may be, it should, I think, be removed unless the liver is distinctly felt to be involved. The patient should be given the benefit of the doubt.

Again, the enlargement of the lymphatic glands may appear to the surgeon to be so extensive that a radical operation is impossible. But it must be remembered that, although these glands are enlarged, they may not be infiltrated with malignant cells ; in other words, the enlargement may be merely inflammatory. I have proved this repeatedly in carcinomata of all parts of the alimentary tract. These growths ulcerate early ; and I feel convinced that the resulting sepsis alone is often a cause of the enlargements of the lymphatic glands. Limiting my remarks to carcinoma of the colon, I have on many occasions, after a most exhaustive microscopical examination of the enlarged glands, found that although the glands nearest the growth were actually infiltrated with malignant disease, those more distant were swollen merely by inflammatory reaction. I contend, therefore, that patients in these cases also should be

given the benefit of the doubt, and that the growth should be removed. I also venture to think that, if the removal be performed on the somewhat extended principles which I have sketched above, in the majority of cases both the malignant and all the inflamed glands will at the same time be extirpated. If the growth be adherent to neighbouring structures, removal should not be attempted, except perhaps in those cases in which the adhesions are so delicate that the slightest force breaks them down. These slight adhesions are probably inflammatory, but we have not yet got sufficient statistics to establish this point. In two cases in this series—one in which a growth was adherent to the liver, another in which it was adherent to the spleen—the adhesions were by no means dense, yet on carefully examining the involved surfaces of liver and spleen it was found that both viscera were involved. Suppuration prevents any radical operation. In one case in this series, that of a cæcal growth around which was a very small collection of pus (about 2 drachms), the tumour was removed, and the general peritoneum was shut off by careful gauze-packing. The patient died on the eighth day from exhaustion. There was no evidence of general peritonitis at the autopsy, but on examination of the glands I was able to show that malignant disease had been left behind. If a more extended operation had been performed in this case, I cannot help feeling that it would have been well-nigh impossible to prevent soiling of the general peritoneum. This is a most unusual condition to find at the operation.

After the removal of the growth the method of anastomosis varies with different surgeons. Should an end-to-end or lateral anastomosis be performed? Should a mechanical appliance (*e.g.*, Murphy's button) be used, or not? These are questions which have been much discussed. In general it may be said that an end-to-end anastomosis may safely be performed when both ends of bowel are completely surrounded by peritoneum and are of the same calibre. How often do we get these conditions in dealing with growths of the colon? In excision of all but growths in the cæcal region, we shall generally have one end not completely covered by peritoneum. In dealing with cæcal growths an end-to-end anastomosis involves the junction of two ends of bowel of unequal calibre—very often a most difficult

procedure to accomplish satisfactorily. Again, one nearly always finds the colon above the growth dilated, and that below contracted; an end-to-end junction is thus rendered difficult. This was well borne out in one case of this series:—A growth of the splenic flexure was excised, and for rapidity a Murphy's button was used to effect the anastomosis of the transverse to the sigmoid colon. The lower end would not admit the large-intestine button without undue tension; consequently a small-intestine button had to be used. It was difficult to suture the upper dilated portion of bowel over this. Notwithstanding the fact that an omental graft was fixed around the junction, localised suppuration occurred.

A lateral anastomosis will, I think, be found quite as easy of performance as an end-to-end junction, two layers of continuous suture being used to effect this. No time need be lost in closing the free ends of divided bowel. If the ends be covered completely with peritoneum, they may be tied with a ligature, invaginated, and oversewn with a continuous, or one or two Halstead's sutures. If one or both ends are not entirely covered by peritoneum, by gently drawing on the bowel the peritoneum can be sufficiently freed and the case treated in the same way in the majority of cases.

Should the anastomosis be effected by means of a Murphy's button? In answering a question like this, one is always greatly influenced by his own experience. Having notes of many cases in which the button was used, and also many in which a simple suture was employed in gastric and intestinal surgery, it may be interesting to compare them. In twelve consecutive cases in which the button was used the following undesirable things happened:—(1) The button was retained once in a gastro-enterostomy; three months later I heard from the patient that the button had not been passed and had not caused any symptoms by its detention; but at any time it is liable to do so. (2) In three cases in which the ileum was anastomosed, end to end, to the ascending colon, the area of colon uncovered by peritoneum was found at the autopsy not to be satisfactorily occluded; and if the patients had lived, leakage would have seemed most probable. In only one of these cases was the excision performed for carcinoma; a similar thing may happen here if simple suture be performed, but is more unlikely.

(3) Suppuration occurred twice around the union. (4) In one case the button after passing some distance from the seat of union became impacted in the intestine, gave rise to subacute obstruction, and had to be removed by enterotomy. (5) In one case of gastro-enterostomy on the eleventh day acute pain occurred in the epigastric region and pneumonia developed ; the button passed on the twelfth day, and the coincidence of the pneumonia and the separation of the button is suggestive that some leakage occurred and gave rise to the pneumonia, which proved fatal.

In twenty-nine consecutive cases of suture not a single unfavourable symptom arose which could be attributed to the methods of anastomosis, and in no case was the shock of the operation so great or convalescence so delayed as to warrant a statement that the junction should have been effected by means of the button. In a lateral anastomosis, I think the button may be positively harmful, in addition to its saving very little, if any, time. A large-intestine button would in all probability have to be used, and the risks of this becoming impacted in the lower contracted bowel are very great. Again, the lower intestine is often so contracted and empty that its wall may fit so tightly over the end of the button as to prevent any onward passage of faeces. Thirdly, scar-contraction is much greater when the button is used than when simple suture is employed, and this in the case of the large intestine may become a real difficulty. In an ileo-colostomy that would have no significance probably. The smaller the button used, the more important does this possible consequence become.

If, after the opening of the abdomen, the growth, from some cause or other, be found to be irremovable, then in all cases a short-circuiting operation should be performed, where possible. This will be possible in all cases, except in those growths situated low in the recto-sigmoid region. In the latter class of case, what should be done ? Many surgeons would at once perform colotomy. Personally, I should be guided entirely by symptoms. There is no evidence to show that the rapidity of growth is lessened materially by diverting the flow of irritating faeces over it. Each case must be judged on its own merits. If pain be marked or obstruction threatening, colotomy must be done. In the absence of these symptoms in any degree, we have to consider whether the patient's life, as it is, is more

tolerable than it would be after a colotomy had been performed. Having notes of a number of cases of colotomy and having seen or heard from these patients at some little time after the operation, I should myself defer colotomy as long as possible and wait for the onset of one of the symptoms mentioned above —either pain or obstruction. It is often maintained that when colotomy is performed during the obstructive stage, *i.e.*, when the bowel has to be opened at once, there is always great danger of leakage. This danger is, I think, spoken of far more often than it is seen. In eighteen consecutive cases of colotomy in which the bowel was at once opened, it did not once occur. A Paul's tube was always used in these cases. It would seem to be far more comfortable to the patients, if the bowel were always opened at once, whether any marked obstruction were present or not. The patients would be relieved of the troublesome flatulence and pain which occur after drawing the bowel out of the abdomen and kinking it somewhat.

It might be asked why, in an irremovable cæcal growth which we know does not cause obstruction, should a short-circuit be performed? My reason for advocating this, is because of the frequency of suppuration in these cases. If suppuration occur, fæces are certain to come from the wound; and, sooner or later, practically all the fæces will pass by this channel. Any one who has witnessed the pain and distress caused by these fluid and irritating fæces will appreciate the importance of doing something to relieve the sufferers. An ileo-colostomy would, I think, materially lessen this. In one case in this series an ileo-colostomy was performed for an irremovable growth of the hepatic flexure. Three months afterwards the patient wrote saying that the bowels acted quite naturally, and that she was in very fair health. She was able to attend to her household duties, and was practically free from all pain, but was getting weaker and thinner. Subacute obstruction was present when this patient was operated upon. If the obstruction had become complete, colotomy would have been the only available treatment. Her condition after the ileo-colostomy is incomparably better than it would have been after a right iliac or lumbar colotomy.

If suppuration be present, the abscess must be incised; but before opening the abscess, laparotomy should be performed

with the idea of creating a short-circuit. In cæcal growths the reason of this has already been given. In growths situated elsewhere the reason is twofold. In the first place, obstruction is almost certain to supervene ; and although after opening the abscess fæces will be discharged from the fistula, the relief given in this way will probably be very imperfect. In the second place, by first performing an ileo- or colo-colostomy, the almost certain discharge of fæces from the fistula may be very materially lessened, if not entirely prevented. In one case in this series this treatment in reversed order was carried out. An abscess was evacuated in the left loin, and fæces escaped in small quantities through the wound. Insufficient relief was afforded in this way ; and 10 days later the transverse and sigmoid colons were laterally anastomosed through a median abdominal incision which healed by first intention. Within a few days fæces ceased to escape through the wound, and only occasionally was a faecal odour observed. The sinus persisted until death, which occurred four months later ; but the discharge was so slight that the dressing was easily carried out at home, causing comparatively little inconvenience. During these four months the bowels acted fairly regularly, and the condition of the patient was very much better than it would have been, had all the fæces escaped through the abscess-wound, or had a colotomy been performed. In a second case an abscess was incised in the left loin. In a few days a faecal odour was observed, but actual fæces were never seen to come from the wound. The patient left the hospital in three weeks. A few weeks later I heard from him that he had considerable difficulty in getting the bowels to act, and was consequently suffering some considerable pain. Obstruction seemed imminent ; and colotomy would then be the only means of relief. A preliminary colo-colostomy would have probably given much more comfort.

Considering the cases in which complete obstruction, with distended gut and intestinal paralysis, is present, colotomy is the only available treatment. It is not permissible to perform any short-circuiting operation here. If this were done, death would most certainly ensue either from the severity of the operation, unrelieved toxæmia, or peritonitis resulting from the giving way of the sutures. If time permits, and the condition of the abdominal contents allows, the growth should at

the same time be examined, to determine the possibility of its removal. If removal be possible, it should be carried out two or three weeks later, after the patient has sufficiently recovered from the symptoms accompanying the acute obstruction. One of our cases was so treated. A transverse colotomy was performed for obstruction. The condition of the patient was so bad and the abdomen so distended that it was impossible to locate the growth. The patient improved most markedly after the colotomy, and five weeks later the abdomen was reopened; a growth was found at the splenic flexure, and this, along with the portion of colon between it and the artificial anus (*i.e.*, the corresponding half of the transverse colon), was removed. The bowel was united, end to end, by means of a Murphy's button. Suppuration occurred around the union, and an abscess was evacuated on the 7th day. This healed, and the button was passed satisfactorily. Now, 21 months after the operation, the patient is in perfect health, and recently has undergone an operation for the cure of a ventral hernia. It will be noticed that, in this case, the growth was in the region of the splenic flexure; and the corresponding half of the transverse colon was removed, as this was clearly the best way of dealing with the artificial anus. The fact that this length of colon was removed with the lymphatic "drain" of the growth may account for the good result in this case.

In cases of obstruction a method of procedure which has been carried out more than once is to bring out the growth and some portion of bowel on either side, and to open the bowel above. A little later the growth is removed. Success, it is true, has attended some of these operations, but I cannot help feeling that this is more due to good luck than to anything else. Such an operation cannot satisfactorily deal with the lymphatic channels. It is true that the longer the radical operation is deferred, the more remote becomes the possibility of being able to perform any radical operation at all. But, even if this be granted, it is quite obvious that these patients will not stand the shock of an extensive radical operation, and it is far better to defer this attempt to a time when they have sufficiently recovered, than to deal incompletely with the primary growth and to run such a great risk of leaving infected glands behind.

A PLEA FOR ASEPTIC MIDWIFERY IN GENERAL PRACTICE.

By P. R. COOPER, M.D., B.Sc. (LOND.), F.R.C.S. (ENG.), &c.

IN no department of the practitioner's work, probably, is there at present a wider variance between theory and practice than in the conduct of midwifery cases. Theoretically we have, no doubt, learned much within recent years concerning the causes and means of prevention of puerperal sepsis, which is now generally admitted to be a preventable disease. Practically, however—that is to say in general practice—the incidence and mortality of this grave complication of child-birth still remain as high as in pre-antiseptic days.¹ On the other hand, the incidence and mortality of puerperal sepsis in modern maternity hospitals have declined enormously; for, whereas they formerly exceeded those in general practice, they are now all but abolished. The inevitable inference from these facts appears to be that in general practice aseptic midwifery is still rather an ideal than a reality, and the reason of this I believe to be that antiseptic principles are not at present applied with logical thoroughness in midwifery practice, *i.e.*, they do not receive the same strict attention to detail that is paid to the matter in surgical cases.

It will perhaps be objected here that midwifery cases are not surgical cases, and therefore do not require the same careful attention to asepsis; indeed it is often asserted that "childbirth is a natural physiological process and therefore does not call for any surgical interference." Those who hold such views are merely deceiving themselves by their use of words. The tears or wounds of the vulva, vagina, cervix, &c., resulting from parturition, whether "natural" or "assisted," do not differ essentially from wounds caused by other injuries, and are equally, if not more, liable to septic infection. Moreover, the placental site after labour is an extensive raw surface, in direct communication with large venous sinuses, offering ideal conditions for septic absorption; this is further brought into

¹ *Vide Cullingworth, British Medical Journal, March 6, 1897.*

communication with the exterior by a column of putrescible material in the lumen of the genital canal (consisting of blood-clot, membrane, albuminous discharge, &c.), along which the growth of microorganisms can freely extend. The mode of entrance of septic germs is not difficult to trace. The proximity of a septic cavity—the rectum—into the very orifice of which the perineal lacerations not infrequently extend, and the risk of “soiling” with faeces during and after delivery, only need mentioning as causes which may exist even in the most natural or “unassisted” labours. An even more certain source of infection may be a preexisting septic condition of the vagina itself. Now the advocates of “*laissez faire*” may aver that the vagina is normally aseptic, and that its secretion has bactericidal properties; they may even allege that antiseptics are positively harmful, since they injure the secreting epithelium and destroy those bactericidal powers. I am not prepared to deny that this may be true in some cases, but clinical experience points to such a great number of exceptions—witness the frequency of muco-purulent discharges (? gonorrhœa), the association of ophthalmia neonatorum, the occurrence of abscesses of Bartholin’s glands, &c.—that I do not think we have any right to *assume* asepticity of the vagina in any individual case. It is surely more rational and safer, therefore, in the absence of bacteriological examination, to act as if the vagina were septic, and to endeavour to render it aseptic and to keep it so. No gynaecologist now thinks of doing even the simplest operation on the genital tract without first disinfecting both the exterior and interior of the vaginal region, and it is only logical to adopt the same precautions with regard to midwifery cases, wherein the injury of tissue, loss of blood, &c., involved are frequently far more formidable than in many large surgical operations.

But perhaps the most common source of infection during labour itself is from the hands and instruments of the nurse and obstetrician. It probably does not strike many of the advocates of “non-interference” that even digital examination is an act of interference which may be fraught with the most serious consequences owing to the introduction of septic germs into the uterus. To avoid this, it has been suggested that digital examination should be henceforth discontinued. But even

granting the possibility of correctly determining the position and presentation of the child by abdominal palpation, and of estimating the size of the internal diameters of the pelvis from external measurements, it is obvious that only by internal examination can the obstetrician learn the condition of the cervix, the presence of a marginal or central placenta, &c., and judge of the actual progress of labour. What harm can be done by digital examination, if properly performed, it is difficult to see ; and rather than counsel the abandoning of the vaginal method, which is certain not to be followed in practice, it seems much more rational to teach how to perform it with advantage and safety.

Another reason for endeavouring to secure strict asepsis during every case of delivery and lying in, is that founded on the general experience of mankind, that women are at these times particularly prone to receive infection. Whatever the reason may be—whether due to loss of blood, exhaustion, nerve-strain, auto-intoxication, or the like—there seems to be a general lowering of resistance of the tissues of the body. It is not improbable that microorganisms existing in the vagina, bowel, &c., in a latent and previously inoffensive condition may thence be enabled to develop pathogenic proclivities.

The preceding arguments may well apply to the simplest and most straightforward confinements, they will apply therefore *a fortiori* to severe and instrumental cases. Here the lacerations will almost certainly be greater, and in addition to superficial tearing of the vulva, deep lacerations of the vagina and cervix may also be produced ; these open up the cellular tissue of the pelvis, the infection of which leads to a spreading and often exceedingly malignant form of sepsis.

Not only is care necessary to prevent infection during delivery, but it is equally important to keep the parts aseptic during the puerperium or at least until all wounds are thoroughly healed. Mere perfunctory douching with a weak antiseptic solution once or twice daily is hardly calculated to secure this end. My plea is, therefore, for the *general adoption by the profession of the same care and attention to aseptic detail in the conduct of midwifery cases which is now almost universally accorded to all surgical cases involving an open wound, and until such time as healing is completed.*

I am unable to conceive any valid reason for *not* adopting such care in midwifery practice, and I do not hesitate to say that the present neglect or perfunctory and inadequate performance of aseptic technique is mainly, if not entirely, responsible for the high incidence and mortality of puerperal sepsis in general practice, as well as for the still larger number of cases of chronic ill-health in women dating from confinement or miscarriage. As Dr. Cullingworth remarks,¹ "The only way to avoid the present terrible mortality, and to avoid also the terrible amount of puerperal disease, which, because it is not fatal, is apt to remain unrecorded, is for every practitioner in midwifery to recognise his personal responsibility in the matter."

The following are the details of aseptic technique which I have for some time employed in my own practice with the most satisfactory results. They embrace nothing new, and are merely designed to carry out aseptic principles with logical completeness.

Such matters as cleanliness, light, warmth, ventilation, &c., of the lying-in chamber, exclusion of infected persons or conveyors of infection (*e.g.*, sewer-gas, soiled clothes, &c.), which may be considered under general hygiene, although of the highest practical importance, need not at present detain us.

(1) The first point in aseptic technique is—*the antiseptic toilet of the obstetrician and nurse*. The obstetrician's coat should be removed, the shirt-sleeves rolled up, and a clean long apron or towel put on over the other clothing. The hands and forearms are then thoroughly scrubbed and washed with liquid antiseptic soap, special care being paid to the nails. They are then steeped for several minutes in a 1-in-1000 solution of biniodide of mercury. When the hands have thus been disinfected, the practitioner must then watch that, whenever they inadvertently become reinfected by contact with septic material, the process of cleansing must be repeated. The nurse must always similarly disinfect herself before handling the patient.

(2) *The preparation of instruments, dressings, &c.*—All instruments likely to be used should be sterilised by boiling in carbolised water (1 in 20), including scissors, forceps, dilators,

¹ *Loc. cit.*

needles, &c. A new vaginal douche should be provided, thoroughly clean and disinfected, and kept specially for the purpose, the nozzle being either of glass or metal, so that it can be boiled each time after using.

A supply of tablets for making a 1-in-1000 solution of biniodide of mercury, some pure carbolic acid, liquid antiseptic soap (1-in-20 carbolic), lysol, iodoform-gauze and sublimate-wool or Gamgee tissue, and T-bandages should also be provided. For sutures sterilised silk or silkworm-gut, stored in tubes of carbolised alcohol (1 in 20), answer best.

(3) *The antiseptic toilet of the patient—(a.) Before delivery.*—The bowels should be thoroughly cleared by enema, an aperient having been previously given overnight, if possible. The enema should at once be followed by a washing and swabbing of the anal region, and any parts contaminated at the time, with 1-in-1000 biniodide of mercury solution. Next, the whole of the vulval and perineal regions are well scrubbed with liquid antiseptic soap, and the hair on each side of the labia and at the lower part of the mons veneris is clipped short with scissors, or preferably shaved. A carbolic compress (1 in 40) is then applied over the vulva. The above details may usually be left to the nurse. The practitioner's first duty, after performing his own antiseptic toilet, should be to *disinfect the vagina*, both externally and internally, by swabbing and douching freely with 1-in-1000 biniodide of mercury solution, to which a little lysol has been added for lubricating purposes. This should be done with the same care and thoroughness as though he were about to perform a vaginal hysterectomy. He should then apply a fresh compress, which is kept on as much as possible until the child's head is delivered, the prepared finger or hand being introduced beneath it when necessary for purposes of examination or manipulation.

(b.) *After delivery*, one hand is maintained on the uterus to keep it firmly contracted, and any clots are squeezed out into the vagina. This passage is then douched out with 1-in-1000 biniodide of mercury solution, the finger being meanwhile introduced to clear out any clots, shreds of membrane, &c., and to explore for lacerations of cervix or vagina. Any considerable lacerations are at once sutured, the raw edges being first well cleaned with the antiseptic. A final douching is then

given, and if thought fit, a weaker solution (1 in 4,000) can be used towards the end. The external genitals are then cleaned with antiseptic solution and dried with sublimate- or izal-wool.

(4) *Local antiseptic dressing of the patient.*—A strip of iodoform-gauze wrung out of 1-in-1000 biniodide of mercury solution is inserted within the vagina (to act both as a drain and a filter), and a second piece is applied over the whole vulval region, and outside this a large pad of sublimate-wool or Gamgee tissue is placed, and fixed in position either by a T-bandage or by a folded diaper pinned in front and behind to the lower edge of the abdominal binder.

(5) *After-treatment.*—As the outer dressings become soiled, they are replaced by clean ones; the strip of gauze internally is not changed until the patient is again douched. The washing of the external genitals and the doublings are continued once or twice daily, until all wounds are healed and all discharge has ceased, *i.e.*, at least ten days to a fortnight, *the antiseptic dressings being meanwhile constantly replenished, as in dressing any external wound.*

With regard to the action of the bowels, I would strongly protest against the routine use of aperients on the third day. I have observed a number of instances in which infection has been traceable to "soiling" of the vulval region with faeces (and however careful the nurse may be, it is sometimes difficult to avoid this). So long as the patient is comfortable I see no reason to interfere with the bowels, and in cases where the laceration of the perineum has extended into, or close to, the anus, I prefer to leave the bowels undisturbed for a week or longer, and have never seen any harm result therefrom.

I would strongly urge that unless the medical attendant can thoroughly rely upon the nurse to carry out exactly the above aseptic details, he should forbid her to do anything locally beyond merely changing the external dressings as they become soiled, and he should himself visit his patient at least twice daily for the first week and douche and dress her. I can assure him that any extra care taken in this way will be well repaid, and may save him and his patients endless trouble and anxiety.

As showing the great practical value of proper aseptic technique in midwifery practice, I may say that, since I adopted the method rigorously in my own cases, I have not had a

single case of puerperal sepsis. Large lacerations which were promptly stitched have healed by first intention. I have succeeded in keeping several cases free from puerperal infection, although the passages were certainly previously septic. Large clots and pieces of membrane which have been retained for periods varying from three to thirteen days have been spontaneously discharged, and have then been found to be as sweet and aseptic as if passed immediately after delivery.

The *nipples* of the mother also require attention. They should be washed with boric-acid lotion or listerine solution each time after suckling. If the skin of the nipple be soft and painful, but not excoriated, it may be hardened by applying glycerine and brandy (equal parts) with hazeline. If, however, the nipple be cracked or excoriated, some unguentum acidi borici (four parts) with white wax (one part) may be used. Should the skin become eczematous some starch and boric-acid powder may be tried, but I have found euthymol cream a satisfactory application.

The *aseptic management of the newly-born child* is also important. The *eyes* should be washed out with sterilised normal saline solution containing boric acid (5 grains to the ounce); or if there be any reason to suspect leucorrhœal or gonorrhœal infection a lotion of hydrarg. perchlor. (1 in 2,000) or 1-per-cent. formalin with glycerin may first be used; or, best of all, a single drop of a 2-per-cent. solution of silver nitrate may be dropped into each conjunctival sac (Credé's method).

The *ligatures for the cord* should be aseptic. Silk boiled and steeped in 1-in-1000 biniodide solution answers well. The scissors for dividing the cord should also be aseptic; and after division the proximal portion of the cord should be sponged with 1-in-1000 biniodide solution, and then wrapped in a piece of sterilised gauze and covered with izal-wool.

The *child's mouth and nose* should be wiped clean from all discharges with a solution of listerine.

Any *superficial abrasions, &c.*, must of course be treated on ordinary antiseptic lines.

Cases of *miscarriage* or premature labour should be treated with no less stringent antiseptic details than have been here advocated for ordinary confinements.



HYGIENIC SURGERY.¹

By FRED. K. ETLINGER, M.R.C.S., L.R.C.P.,

Medical Superintendent of the Cotswold Sanatorium.

IN discussing the relations of therapeutics to disease, there is no more important consideration to be borne in mind than the fact that all living tissues naturally react to injury unless they are immediately destroyed thereby ; that is to say, the therapist has not to reckon with the action of disease on an inert body, but with a complicated condition brought about by two distinct factors, the action of the disease and the reaction of the tissues. It must not be supposed, however, that this implies the existence of any specific property or force in the tissues ; there is no independent entity in connection with the resistance to disease, and for this reason it is as well to avoid the use of such equivocal terms as the "natural resistance of the body." The different ways in which this reaction is exhibited form a subject which is too large to be considered here, and for the present purpose it will be sufficient to repeat that all living tissues react to injury.

As a result of this, therapeutics resolves itself rationally into two parts, namely, treatment which aims at the removal or direct counteraction of the cause, and treatment which aims at helping the body to make good the injury. As examples of the former or direct treatment may be mentioned the internal administration of antiseptics to destroy micro-organisms within the body, and the injection of antitoxine in diphtheria to counteract the products of the diphtheria-bacilli ; of the latter or indirect treatment, the sanatorium treatment of consumption forms a good illustration.

The tendency has been to exaggerate the value of the first or direct method, and this has led to many disappointments ; for instance, the injection of antiseptics in septicæmia, intra-pulmonary injections and inhalations in tuberculosis, even the washing of a wound infected with staphylococci—all

¹ A Paper read before the Medical Society of University College Hospital.

these and many more have been tried enthusiastically, and have either failed, or proved to be of far less value than was expected.

It is only in the field of preventive medicine that this method of treatment has met with real success so far, and here its importance cannot be over-estimated. In public and private sanitation excellent results have followed the plan of systematically attacking microbes before they come into contact with the body ; but by going a step farther back, hygiene could effect still better results by avoiding the organisms altogether, or by at least preventing their accumulation in dangerous numbers.

When once the organisms have entered the body, it is easy to see the great difficulties in the way of reaching them with any forces sufficiently powerful to destroy them, so that the comparative failure of direct treatment is natural. The only rational development of this method has been the use of substances prepared by the tissues themselves ; and serum-therapeutics has already met with a certain measure of success, and is a subject of very great importance. As yet, it is still in its infancy, but when more fully worked out, tested and improved it may be expected not only to take the foremost place in direct treatment, but to elevate this method to a position much higher than it at present occupies.

In helping the body to make good the injury indirect treatment aims at the following conditions : firstly, the prevention of reinfection, and secondly, the improvement of the general condition.

Taking these parts separately, prevention of reinfection, either by the same or other organisms, leaves the body free to fight its best against those which have already gained a foothold, and relieves it from the extra strain of having to combat any further attacks of hostile microbes. This is one of the chief principles of the sanatorium treatment of consumption, and is effected mainly by free ventilation which has been proved to arrest the virulence of tubercle and other bacilli and even to cause their death, particularly if aided by sunlight, though it will do so even in the dark. For this reason the rooms are made and furnished in a special manner, so as to admit of thorough ventilation and scrupulous cleanliness ;

and in all well-conducted sanatoria strict precautions are adopted and rules enforced with regard to spitting and the disposal of the sputum, in order to diminish, as far as possible, the risks of reinfection.

But it must not be supposed that it is only in the treatment of tuberculosis that the prevention of reinfection applies ; it does so in all diseases, whether primarily infective or not. It is in this way that so-called intercurrent affections are preventable, and in such cases as heart-disease, renal disease, cirrhosis of the liver, &c., prevention of infection would at any rate diminish the liability to those bouts of illness which are so apt to bring about a fatal termination. In organic heart-disease, for instance, the tissues, left to themselves, may be quite able to cope with this successfully and to bring about efficient compensation by such processes as hypertrophy ; but they may not be able to maintain it, if there arise further calls on their powers, such as infection by the organisms of the common "cold," of influenza or of pneumonia, whereas by adopting an open-air life all these affections would be avoided.

Considering next the second aim of indirect treatment, what are the means at our disposal for improving the general condition ? Firstly, there is *air*. The body needs a constant supply of air, and this must not be lacking either in quantity or quality, if the machine is to work at its greatest advantage. The chief indication for providing air which is fresh and pure has already been considered under the heading of prevention of reinfection, and this must be supplied liberally and constantly, in order that it may not become polluted, and so that even the slightest degrees of asphyxia are avoided. The quantity of air provided should be such that, even indoors, it is as frequently changed as it is outside ; and in quality also the standard out of doors should constantly be maintained in every part of the sick-room, so that a patient never breathes air which has already been respired and contaminated either by himself or by others.

The second most important means of improving the general condition is by suitable *food*. In order that the tissues may best be able to combat disease, it is necessary to keep them properly nourished ; and by judicious and liberal feeding the body-weight should be brought to its normal limit, and

maintained there, or at a point slightly above the normal, so as to have a small reserve in store.

Thirdly, the subject of *exercise* must be considered. Activity of the tissues is necessary, not only in order to maintain their nutrition, but also to insure the proper performance of their functions ; on the other hand, they require to remain passive at certain times and under certain conditions, so that, starting with absolute rest, we have also at our disposal, as therapeutic agents, massage and special exercises, and also general exercises, such as riding, cycling, and, most important of all, walking.

In order to point the contrast between improving the general condition and increasing any specific resistance to disease, we may consider an infected body as a garrison besieged by a hostile force. Direct treatment corresponds with a relief-party, which in its turn makes an attack upon the enemy ; but indirect treatment leaves the garrison to deal with the besiegers and confines its attention either to driving off the enemy's reinforcements, or to conveying food to those within the castle. Thus we see that indirect treatment only indirectly affects the reaction of the tissues by nourishing and supporting them whilst they themselves do the work.

So far we have considered the aim of therapeutics and the possibilities of scientific hygiene ; let us now see how far these principles have been applied in surgery. Both in operative and non-operative surgery very little attention is devoted to maintaining and improving the general condition of the body. Thus it is customary to keep both hospital wards and private sick-rooms quite inadequately ventilated ; no attempt is made to supply the patient with the continuous current of fresh air, which we have seen to be so essential, and he is forced to breathe an atmosphere which, instead of being a therapeutic agent, is often highly dangerous even to a healthy man. In the matter of food also, the tendency is rather to lower the general condition by giving too little nourishment, and that often of the invalid kind, when in many cases plenty of solid food is urgently required to increase or maintain the body-weight. Then as regards exercise also, the question is seldom properly considered, and indications for employing massage or regulated exercises, for instance, are

frequently neglected. Certainly no attempt has been made to apply these principles generally in every surgical case; and it is only in certain few special instances that they are tried at all, and then very imperfectly and without any real recognition of their importance or of the necessity for considering them constantly and exactly in relation to every individual case whatever it may be.

In the treatment of tuberculosis for instance, as at Margate, there is no exact regulation of diet or of rest and exercise, nor is it seen that the patients have a liberal supply of perfectly fresh air day and night without intermission; and yet the results of even the partial and unconscious employment of hygienic measures show a certain degree of success, which has led to the vague supposition of some specific quality in the Margate air.

Again in the Weir-Mitchell treatment, though this is more medical than surgical, there is the same incompleteness and unreasonableness; the questions of rest and exercise, and also of food, are attended to, but more or less blindly, whereas the importance of thorough and constant ventilation is altogether ignored.

The great mistake is made of thinking that only tubercular cases require hygienic treatment; but are the results of surgery in other diseases so perfect that we need not try to give every advantage in them also? Unfortunately this is not the case; and since it has been clearly proved that hygienic methods are beneficial in tubercular cases, even when partially employed, surely they should be thoroughly and scientifically tried, not only in this disease but also in every other surgical case. In all "septic" cases, for instance, there are strong indications for systematic hygienic treatment, and the following facts help to point the moral. In phthisis it is the septic symptoms which yield most readily to "open air" treatment. Again where there are septic sinuses in tubercular cases it has long been recognised that plenty of fresh country air and a liberal dietary are the greatest helps to healing. Yet again one can say from personal experience of a series of cases of appendicular abscess, opened and drained in hospital, that the discharge often continues for weeks or months until the patients are sent away to country or seaside air, when it ceases rapidly,

and the wound heals, sometimes in the course of only a few days.

Not only in tubercular and septic cases, but in every case of surgical disease, the patient should be supplied with a continuous current of fresh air, day and night, throughout the treatment. If circumstances permit, he should spend at any rate the greater portion of his time out of doors ; but when indoors, he should be in a room which is constantly ventilated in every part, and in which the air is always as pure as that outside. The diet should be abundant and nourishing, and should be judiciously pressed until the body-weight has reached its normal limit, when the amount of food should be diminished. Rest or exercise should be regulated according to the requirements of the body, and in every case this should be attended to exactly and systematically.

Since this is the ideal we may state now two propositions which appear to be invincible : firstly, that all cases which are now known to improve are likely to do so with more certainty if placed under these conditions ; secondly, that any disease which has ever been known to recover spontaneously is more likely to do so if these principles are carried out. Remembering these two important propositions we may briefly consider one or two diseases.

In surgical tuberculosis there can be little doubt that very good results would attend hygienic treatment, and this has frequently been advised, though only in a very incomprehensive manner, as for instance in the article by Mr. Tubby published in the *British Medical Journal* in February, 1903, in which he advocated the treatment of external tuberculosis, particularly in children, in country or seaside hospitals rather than in towns. Mr. Tubby's view appeared to be that improvement would result owing to the different quality of country air, as opposed to town air ; but though this is perhaps true, it is an almost infinitesimal part of the whole truth.¹

A very interesting article by Dr. Douty was also published in the same journal about the same time. This was entitled

¹ When writing the above, I had not seen the article in the *British Medical Journal* of October 17, 1903, by Mr. Deanesley, of Wolverhampton ; having now done so, I find that it is no longer true that the open-air treatment of surgical tuberculosis has not been efficiently recommended.

the "Open Air Treatment of Syphilis," and in it he pointed out that the well-nourished, healthy sportsman, leading an out-of-door life, suffered lightly when infected with syphilis, whereas the underfed, stay-at-home scholar was attacked much more severely, and this in spite of the fact that the former frequently neglected his mercury. Dr. Douty deduced from this that "open air" treatment would be of benefit in syphilis, and strongly advocated its adoption in all cases. There is indeed every reason to expect that the conclusion is correct, and this valuable suggestion should certainly be acted upon.

In such cases as lymphadenoma and actinomycosis it is reasonable to expect that good results would follow if treatment were conducted on these lines, as in these cases we have to rely almost entirely on the reaction of the tissues themselves and by improving the general condition we are helping the body to make good the injury.

Lastly, it is impossible to pass over malignant disease without mention, though it might be safer to do so. Let us be content with remarking that since occasional spontaneous recovery is recorded, it is evidently not impossible for the tissues to overcome and survive this injury; and this being the case, it is perhaps justifiable to hope that by placing the body under the most favourable conditions the chances of recovery would be increased.

Up to now we have been discussing hygienic treatment as a method of cure, it must next be considered whether we are justified in excluding any patient whatever from its benefits.

In plastic surgery—using the term in its widest sense to include all cases where there is deformity but no disease—the first essential is that the patient should not be operated upon until he is in perfect health; and if the general condition is not at its best, it should be improved before operation by the methods we have been considering, namely, by fresh air, by food, and by regulated rest and exercise.

Next, at the operation itself as little damage as possible should be done to the health of the patient, and for this reason it is important that the full allowance of fresh air should be provided. It has been found that the wound is not very liable to be infected by the air, but none the less, for the sake of the wound alone, the air should be as fresh as possible, so as to

avoid every possible risk. More important, however, is the necessity for pure air for the patient to breathe throughout the operation, and the supply in hospital theatres and in private operating-rooms is, as a rule, hopelessly inadequate. In view of the necessary presence of several other persons besides the patient, nothing less than widely-open windows will admit sufficient air, and if a free current from outside were allowed to pass continuously through the room the bad effects of all operations would be much lessened, and many respiratory troubles and other infections would be avoided. The aim of the surgeon should be to limit the injury he inflicts as much as possible, and it is just as important not to poison the patient with foul air as it is not to poison him with antiseptics. During the recent South African War soldiers who were operated upon in the open recovered in a remarkable manner, and there is no doubt that this was owing to the impossibility of excluding fresh air from the patients and not, as has been so frequently stated, to some peculiar healing power possessed by the air in South Africa. The danger of exposure to cold need not be an obstacle in the way of efficient ventilation, as it would be easy to protect the patient with suitable coverings, only the immediate site of the operation being exposed, and hot-water bottles and even a heated operating-table can be used.

After the operation also strict hygienic treatment is again necessary, so that the tissues may quickly and easily repair the injury ; and it must be carried out just as before, every detail being carefully attended to.

We have seen now how important it is that every surgical case should be placed under ideal hygienic conditions, and it cannot be too strongly insisted upon that this should be the first aim of the surgeon. Specific treatment of disease is at best limited and often unsatisfactory, but it is useless to test the powers of any specific remedy until the tissues are in a proper condition for making the best use of it.

There will be no harm in repeating once more what is meant by ideal hygienic conditions. Every possible source of infection or reinfection must be avoided, and the general condition of the tissues must be built up and maintained, so that all the physiological functions of the body are performed as

perfectly as possible. We must have a constant and uninterrupted supply of fresh air as the first essential ; an abundance of nutritious and well-cooked food, judiciously given and insisted upon, in order to bring the body-weight up to its normal point and to maintain it there ; and careful and systematic regulation of rest and exercise in order that strength may be increased without exhaustion.

These points practically form the basis of the sanatorium treatment of consumption, and it is the application of the principles and details of this treatment, specially modified to meet the requirements of individual cases, which is now advocated as the strongest weapon we can employ in the treatment of every kind of surgical affection.



CEREBRAL AND MENTAL DISEASES IN RELATION TO GENERAL MEDICINE :

A REVIEW OF RECENT LITERATURE.

By H. CAMPBELL THOMSON, M.D., F.R.C.P.,

Assistant Physician to the Middlesex Hospital; Physician to Out-patients at the Hospital for Epilepsy and Paralysis, Maida Vale.

LUNACY STATISTICS.

IN the Report of the Commissioners in Lunacy for the past year, 1903, it is stated that on January 1, 1903, there were in England and Wales 113,964 notified lunatics, which was 3,251 in excess of the number on the same day of 1902. The average annual increase in the ten years ending December 31, 1902, was 2,414. The proportion of insane to the whole population has now reached 1 to 293, and this ratio has steadily increased from the year 1859, when reliable statistics of insanity first commence, the proportion being at that time 1 to 36. When it is remembered that these figures refer only to the notified cases, and take no account whatever of all the borderland cases which just manage to escape certification, but which nevertheless cannot be said to be in any sense in their right minds, it cannot be disputed that the causation and treatment of insanity is one of the gravest questions of the present time.

The treatment of confirmed insanity has no doubt made great progress, and recently the important researches initiated by the London County Council, and conducted under the able guidance of Dr. F. W. Mott, F.R.S., have thrown considerable light on the aetiology and pathology of mental disorders, and the information obtained, if acted upon, cannot fail to aid in prevention, which is the point to be aimed at.

There can be little doubt that if the ratio of the insane to the total population is to be appreciably reduced, more attention must be given to prevention than has hitherto been the case. Great social problems require to be dealt with in relation to intemperance, overcrowding, and other results of modern town life, as was recently pointed out with much force

by Dr. Robert Jones,¹ whose experience at Claybury Asylum has enabled him to trace out very clearly many of the paths along which the insane have travelled.

In the United States it would appear that the same causes are in operation. The results of a statistical inquiry by Dr. William A. White,² Superintendent of the Government Hospital for the Insane at Washington, have been recently given in the *British Medical Journal*. Dr. White finds that the cause of the greater prevalence of insanity in certain parts is to be sought in density of population and in the stress of the struggle for subsistence, together with the predominance of mental work in the more populous regions. Dr. White believes that the subtle causes of mental disorder are so far below the surface that it is not easy in the present state of knowledge to arrive at definite conclusions on the subject.

THE PRODROMATA OF THE PSYCHOSES.

It is above all desirable to study and treat cases from their very commencement, especially as many of these may be aggravated or even caused by bodily diseases. In this connection an interesting contribution has recently been made by Dr. T. S. Clouston,³ dealing with the "Prodromata of the Psychoses and their Meaning." Dr. Clouston considers that sufficient attention has not been paid to the fact that attacks of mental disease may have early symptoms that are often not actually mental in character, and he goes on to show that all sorts of sensory, vasomotor and motor symptoms may usher in an attack of insanity, a due recognition of the character and meaning of which might in some cases enable the mental attacks to be anticipated or even warded off. The different groups of prodromal symptoms are fully discussed, and the fact that a healthy sensory system is necessary if the mental functions are to work properly, is pointed out. It is shown that by keeping the necessary relationship between the sensory and mental activities of the brain in mind, many of the clinical facts of an attack of melancholia can be explained, and that many suggestions can thus be obtained for its proper treat-

¹ *The Times*, December 29, 1903.

² Quoted in *British Medical Journal*, February 13, 1904.

³ *Review of Neurology and Psychiatry*, December, 1903.

ment. It is important to bear in mind that melancholia in most of its forms is by far the least serious disturbance of the mental areas. It is the condition least removed from mental health, and in the more severe cortical explosions of mania more or less of mental depression comes first of all, thus preceding the deeper mental dissolutions. Motor disturbances, neurasthenia, insomnia, hysterical attacks, circulatory disturbances, blood-changes, digestive disturbances, menstrual derangements, and mental changes themselves, are all dealt with from the point of view of prodromata. In summing up, Dr. Clouston concludes that an attack of mental disease is commonly not a simple or localised phenomenon ; that lower parts of the sensory apparatus very often breakdown before the mental apparatus in the higher regions ; and that this breakdown occurs chiefly in the brains hereditarily-disposed to the psychoses, for all the symptoms which have been pointed out as common prodromata of insanity occur in non-disposed persons without any attack following. These prodromata, therefore, deserve careful attention in predisposed persons. Finally, the important fact is emphasised that the whole class of mental diseases require to be regarded and treated, not as local disturbances, but as widespread departures from the normal physiological condition of the whole organism.

RELATIONS BETWEEN MENTAL SYMPTOMS AND BODILY DISEASE.

The relation of mental symptoms to bodily diseases, with special reference to their treatment outside lunatic asylums, has also been treated by Dr. Nathan Raw,¹ who first draws attention to the great frequency of mental symptoms developing in the course of bodily illness, and secondly, to the unsatisfactory methods which at present exist for dealing with such cases. The cases to which he refers are those in which mental symptoms develop in the course of some bodily disease, such as pneumonia, typhoid fever, Bright's disease ; in some toxic poisoning, as by alcohol or belladonna ; or in the course of some septic infection, such as puerperal septicæmia. For such cases it is necessary to provide special facilities for nursing and treatment, without having recourse to certifying them and

¹ *Journal of Mental Science*, January, 1904.

confining them as persons of unsound mind. Dr. Raw goes into the various symptoms met with in general diseases in considerable detail, and he would like to see a reception-hospital for mental diseases established in every town, where people might be admitted at once and detained for a period not exceeding six weeks ; if, at the end of that time recovery had not taken place (or before this if necessary), they could be drafted to the asylums.

THE CONDITION OF THE BLOOD IN EPILEPSY.

The condition of the blood in epilepsy has recently been investigated by Dr. Robert Pugh,¹ who shows that the alkalinity of the blood undergoes marked variation in connection with this disease. The average alkalinity of the blood is lower than normal between the fits, and more especially so when the patients are also suffering from gastric catarrh and constipation. There is also a sudden and pronounced fall in the alkalinity immediately before the onset of a fit, and a further diminution after the fit is over. Dr. Pugh discusses the possible cause of these variations. He thinks that the exact *rôle* which this diminution in alkalinity plays in the production of epileptic attacks is difficult to estimate, but he points out that it is of the utmost importance for any cell in the body to have a proper, adequate, and pure supply of blood, more especially so in the case of the cerebral neurones, which are extremely susceptible to change in environment.

These results have important bearing on treatment, and Dr. Pugh has found that he has been able to diminish the number of fits by maintaining the alkalinity of the blood within physiological limits ; but unfortunately he finds that the effects of drugs in this direction are transient, and that it is impossible to elevate and maintain the alkalinity within physiological limits for any appreciable length of time. The bromides raised the alkalinity even to the normal level for a certain time, but on continued administration, even when the dose was increased, the alkalinity eventually fell. The best results were obtained from bromide of strontium combined with bicarbonate of soda (ââ. gr. xv.).

Dr. W. Hamilton Hall² has written a paper to show "that

¹ *Brain*, Part C.

² *Journal of Mental Science*, October, 1903.

epilepsy cannot be caused by toxæmic conditions," and begins by referring to the idea that is held by some that these toxines, if they exist, have their origin in the alimentary canal. Dr. Hall goes on to show that if this idea is to be accepted, the epileptic must be able to get out of his food something which the non-epileptic cannot get, and to make himself an epileptic with it. Supposing for the sake of argument, he says, that such a toxine exists, the fact that it makes an epileptic of one and not of another demonstrates a personal difference, and when patients are both epileptic and dyspeptic, the two conditions cannot be truly regarded in any way as cause and effect. The relation of dyspepsia to epilepsy is fully discussed, and the question as to why the traumatic cases have no need for a hæmic toxine is asked.

The relation of toxines to mental and other diseases of the nervous system has received a great deal of attention recently ; and as far as epilepsy is concerned, it seems to the writer of this review that we are in much the same position as we are in the causation of some forms of insanity, the question of which was reviewed at some length in this Journal in 1902. Put briefly, it would seem that while the toxines are often important factors, they are seldom in themselves sufficient to produce insanity, unless other predisposing conditions are also present.

The present writer¹ discussed shortly the relationship between epileptic fits and poisons in a paper published during the past year, and pointed out that at any rate in a large number of cases the nervous system appears to be primarily at fault and so unable to resist that which would produce no effect upon a healthy person. In this way a toxine, when it exists, might bear the same relation to an epileptic fit in an adult as peripheral irritation bears to the onset of a convulsion in a rickety child.

THE MENTAL AND MORAL EFFECTS OF THE SOUTH AFRICAN WAR ON THE BRITISH PEOPLE.

The mental and moral effects of the South African War (1889-1902) has been made a subject of study by Dr. R. S. Stewart,² the deputy medical superintendent of the Glamorgan County Asylum, and he proceeds to show that the war

¹ *The Clinical Journal*, September 16, 1903.

² *Journal of Mental Science*, January, 1904.

produced an immediate and very pronounced, though unlasting, modification of national character and conduct. Three periods the author tells us can be distinguished in the campaign. The first, which extended over three months, was that of Britain's greatest stress. In the second period, which lasted four months, the opposition of the enemy was gradually broken, and the national stress was relieved. The succeeding two years forming the final period, were characterised by opposition devoid of organisation. In the early days of the war the feelings engendered were tensely painful ones; but there was no despondency, but rather a spirit of determination to overcome the difficulties. The interests of self were for the time being put aside, and no sacrifice was felt to be too great. On the other hand, in the second period, when the tension had been removed, the dominant feelings of the people were those of joyousness carried to the verge and beyond the verge of abandonment.

The author then examines in detail the statistics of the different forms of crime during the war-time, and also the statistics relating to births and marriages.

Finally, Dr. Stewart concludes that the events of the last three months of the year 1899 were such as to induce a very unmistakable change in the national characteristics. The nation as a whole had its criminal propensities checked; there was manifestly lessened disposition towards all forms of self-indulgence, a heightening of the respect for the lives and property of others, and a lessened disposition to shirk the troubles and responsibilities of life. The nation's mental stability was improved, and its power of self-control increased. There was for the time being an unmistakable improvement in the whole national *morale*—a change the cause of which could only be found in the circumstances of the time, which were of such a nature as to constitute a menace to the safety and existence of the Empire. Gradually, however, the effect produced by these events passed away, until by the end of a year it had vanished, and there was a return to something even worse than the previously prevailing conditions. Dr. Stewart concludes by saying that we were rudely and painfully roused out of our moral trypanosomiasis; but to all appearance, the danger being overpast, the reaction has proved, and is likely to prove in the future, productive of the gravest results.

REVERSALS OF HABITUAL MOTIONS.

Dr. J. Weir Mitchell¹ has recorded some interesting cases of which the chief characteristics were tendencies to reverse normal actions. In the first instance the patient either did exactly the opposite to what he intended to do, or else he did what he wished to do in the reverse way to what it would usually be done. When, for instance, he was on the landing of a staircase intending to go up the next flight of stairs, instead of doing so, he found himself going down the flight he had just ascended, and going down backward. After descending a few steps in this way he pulled himself together and went up the stairs as usual, though with some incomprehensible difficulty. In the street, if the action of walking ceased to be automatic and he recalled the fact that he was walking, he would sometimes walk backward a few steps, and finally recovering himself would go on as before. This peculiarity got troublesome, but did not appear to go farther, and the patient continued to be a man of mental value in the ordinary affairs of life. In another case, a middle-aged lady got so much in the habit of looking at the end of a book before she read the beginning that at last she was quite unable to read any book until she had read a few pages at the end. Cases of reversal of actions in putting-on clothes are given, and also two very curious instances of speech-affections.

One patient used to say exactly the reverse of what he meant, so that when he wished to remain "indoors," he would say, "I will remain *out* of doors." Another man, who was suffering from a malignant growth of the anterior part of the brain, reversed his actual words in a very peculiar manner. When he wished to have a favourite cat brought to him he kept saying "tac-im" instead of "my cat," and so on with many other words which were capable of being turned in this way.

A further contribution to this interesting subject has recently been made by Professor A. Pick.² Additional cases of a similar nature are recorded, and Pick thinks that if all the histories are reviewed, the cases may be divided into two classes, viz., those in which there are disturbances of conception and the conception leads to contrary action, and those in which

¹ *Journal of Nervous and Mental Diseases*, April, 1903.

² *Journal of Nervous and Mental Diseases*, January, 1904.

the disturbances seem to be purely motor and in which the reverse motion is substituted for the desired one. The first class can, however, be further subdivided according to whether a delusion or an imperative idea is at the bottom of the condition.

THE PSYCHOLOGY OF TUBERCULOSIS.

Dr. G. A. De Santos Saxe¹ discusses the psychical relations of tuberculosis in fact and in fiction. After reviewing the characters of tuberculous people as portrayed by novelists, he turns to medical writers, and finds that the subject has been studied chiefly in relation to insanity and crime, while the psychical relations of average cases of tuberculosis uncomplicated by marked psycho-pathological features has not received so much attention. It is with this part of the subject that he now deals. He considers that clinical and pathological evidence are both in favour of the mental changes being due to the specific toxine of tubercle. The early stages of consumption are, Dr. Saxe says, very frequently accompanied by the symptoms of neurasthenia and psychasthenia, and at times by various degrees of hysteria. With the progress of the disease and its realisation by the patient there comes into play gradual loss of will-power and self-control which, so to speak, unmasks the man or woman suffering from the consumption. This loss of self-control, of course, varies within the widest limits according to the natural temperament and the gravity of the disease, but this loss of self-control and selfishness play the most important parts in the moulding of the mental traits of tuberculosis. Most patients, however, seek to hide from themselves and the outer world the true nature of the disease. This mental state, accompanied by an enfeebled body, makes the patient very open to suggestion, and he is always ready to acquire new ideas of what is good or bad for him in all kinds of accidental ways. Extreme variability of temper with alternating depression and hilarity is marked, and he becomes irritable and easily fatigued by mental exertion.

With regard to insanity and tuberculosis, Dr. Saxe thinks that the tubercular toxine is probably one of the contributing factors, and points out that the term "tubercular insanity"

¹ *New York Med. Journal*, August 1, 1903.

should not be used to designate a type of insanity, since there is no form peculiar to tuberculosis. Mental and physical degeneration, together with the tubercular intoxication already referred to, are the chief factors in the make-up of the tuberculous criminal. The euthanasia of consumption is, the author thinks, to be explained on purely physical grounds, the changes in the nervous system being so marked at the time of approaching dissolution that they efface the patient's suffering and render his death easy.

Dr. Nathan Raw also alludes to the mental aspect of tuberculous patients in his paper already referred to. The condition known as "*spes phthisica*" is not in his experience of common occurrence, and is only seen in patients who are not aware of the true nature of their affliction. In later stages depression, fits of moodiness, with irritability of temper, and even delusions of suspicion and fear, are not uncommon.

FRIGHT AS A FACTOR IN THE CAUSATION OF FACIAL PARALYSIS.

The ætiology of many cases of peripheral facial paralysis is by no means altogether satisfactory ; and after remarking on this fact, Dr. Leonard Williams¹ brings forward a case which appears to show that emotion such as fright may sometimes be a contributing cause, for in his example the facial paralysis appeared to follow directly upon a fright caused by the woman dropping her six-months-old baby. No history of exposure to cold could be obtained, and Dr. Williams suggests that the action of fright in this case may be analogous to its action in chorea, and that rheumatism may at the same time still be the underlying factor in the facial cases, as it certainly is in chorea.

¹ *Review of Neurology and Psychiatry*, September, 1903.



SOME RECENT WORK ON DISEASES OF THE PANCREAS.

By R. SALUSBURY TREVOR, M.A., M.B. (CANTAB.).

Assistant Lecturer on Pathology and Curator of the Museum, St. George's Hospital Medical School.

DURING the last four years much has been done to advance our knowledge of diseases of the pancreas. The progress which has been made belongs more to the domain of ætiology and pathology than to that of treatment, with, however, one notable exception. The recognition of the importance of chronic pancreatitis has been crowned by a method of treatment, which must be called a method of cure.

In the following review, in addition to the papers on the pancreas in disease, some of the recent work on the normal anatomy and histology of the gland has been included, in order that any subsequent references may not be obscure.

ANATOMY.

Opie (*Johns Hopkins Hosp. Bulletin*, Sept. 1903, p. 229) has investigated the ducts of the pancreas in one hundred subjects. He finds that in no instance was there any departure from the type, which should be expected, if the development of the gland be taken into consideration. Normally the pancreas arises from three buds springing from the intestinal canal, one of which is dorsally situated between the hepatic duct and what will subsequently become the stomach, whilst the other two develop later from the ventral aspect of the duodenum on either side of the hepatic duct. From the ventral outgrowths is formed that portion of the pancreas which lies in contact with the bile-duct and which is drained by the duct of Wirsung; from the dorsal bud is formed that part of the gland which is drained by the duct of Santorini. The duct of Santorini terminates in a small papilla a short distance above the bile-papilla.

In every case examined by Opie two ducts were present, although occasionally one or the other was so small that it was found with difficulty. The duct of Wirsung and the

common bile-duct always joined, whilst the duct of Santorini invariably entered the gut by itself at a higher level. In 10 out of 100 instances the two ducts did not anastomose within the gland. In 20 the duodenal end of the duct of Santorini was not patent, and in a considerable number of specimens the orifice of this duct was so small as to be functionally useless. In at least a third therefore of all individuals the duct of Santorini cannot take the place of the duct of Wirsung, should the latter become occluded. On the other hand, in 11 of the 100 specimens the duct of Santorini was as large as, or larger than, the duct of Wirsung.

The orifice of the duct of Wirsung and of the common bile-duct was also examined, and the results obtained are of importance, in that disease of the bile-passages is often associated with disease of the pancreas. The two usually unite to form the diverticulum of Vater, and open by a common orifice on the biliary papilla. In 11 out of 100 specimens the ducts opened separately at the summit of the papilla, and there was no common channel. In the remaining cases the diverticulum varied considerably in length—the minimum being less than one millimetre and the maximum 11 millimetres. The average diameter of the common duodenal opening was $2\frac{1}{4}$ millimetres. In 30 cases only did the length of the diverticulum equal or exceed five millimetres. Hence it will be seen that with occlusion of the duodenal orifice by a gall-stone, the patency of the bile-duct and the pancreatic duct, and their conversion, so to speak, into a common channel, can only be maintained if the stone is very small and the diverticulum only partially filled. This point will be referred to again in connection with Opie's theory of the causation of acute pancreatitis.

HISTOLOGY.

The same author (*Ibid.* 1900, Vol. XI., p. 205) has made an especial study of the islands of Langerhans. He finds that they are composed of cells of epithelial type having the same origin as those which form the acini. Ramifications of the pancreatic duct do not enter the interacinar islands, while on the other hand these bodies have an intimate relation with the vascular system. They occupy a definite position within the pancreatic lobule (of the cat's, but not of the human gland), and are more

numerous in certain parts of the gland than in others. In 0·5 square-centimetre sections of the human pancreas Opie finds that the average number of islands present in the head, body, and tail respectively are 18·3, 18·0, and 34·0. The author was unable to confirm Lewaschew's observation, viz.: that by prolonged stimulation of the gland by overfeeding or by the administration of pilocarpine, which affects the pancreas in the same way as it does the salivary glands, it is possible to transform ordinary secreting acini into islands of Langerhans. Experimenting on dogs, to which were given subcutaneous injections of pilocarpine muriate in varying doses and for varying lengths of time, Opie was unable to find any increase in the number of islands. He admits, and others who are familiar with the histology of the pancreas will agree, that in the normal gland one often sees groups of acini altered in appearance and staining-reactions. In these groups the cell-protoplasm no longer takes the nuclear stain, as does the normal cell, but it stains an uniform pink with eosin and shows a centrally-placed nucleus. Such altered groups of acini bear a striking resemblance to the interacinar islands. Opie says, however, that the "arrangement of more or less columnar cells around a certain lumen is still preserved, and one does not find similar areas in which this arrangement is lost. The lumen is usually very conspicuous and is often considerably dilated and filled with products of secretion which stain deeply with eosin. It seems probable that these groups of acini are altered as the result of peculiar functional activity—it may be, of over-stimulation of the gland. There is at least no evidence that they represent transitional stages between glandular acini and islands of Langerhans."

The question just raised is one of great importance, inasmuch as a prominent part has been assigned to the islands in the metabolism of the carbohydrates. Opie's experiments are but three in number, so that a more extended series of observations is advisable before entirely setting aside Lewaschew's results. In fact Mankowski (*Arch. f. mikr. Anat. u. Entwicklungsgesch.* Bd. LIX., S. 286—294) comes to entirely opposite conclusions. From an extensive series of observations he finds that the islands of Langerhans stand in the closest possible relationship to the pancreatic acini, with which they

have a common blood-supply, and that they open into the ducts. The islands have no definite capsule. Transitional stages between them and the ordinary acini can be observed. The cell-protoplasm of the islands is extremely delicate, and readily affected by ordinary fixing agents; it also possesses special chemical affinities, as shown by its reducing action on solutions of silver nitrate. The number of islands in the same animal is capable of variation, increasing during activity of the gland and diminishing during rest. Mankowski looks upon the islands as a characteristic feature of the highest possible stage of activity of the gland. Neighbouring lobules of the gland, and even different cells of one and the same lobule, show transitions both morphologically and physiologically, from the one state to the other. The author criticises the results of other observers (Schulze, Ssobolew), who base their belief in the distinct and separate existence of the islands as such on their greater resistance to the chronic inflammatory process, which follows ligature of the ducts or of different parts of the gland. He finds that, if the pancreas of a guinea-pig is ligatured in two places near the splenic end, and portions examined at intervals from in front of, between, and behind the ligatures, all trace of gland-substance disappears from the tissue between and behind the ligatures; but that, in the cirrhosed tissue in front of these, the islands of Langerhans are as abundant as, if not more so than, the ordinary acini of the pancreas. If then sections from this portion confirm the theory of the greater resistance, and thus of the separate entity of the islands of Langerhans, the same thing cannot be said of sections of the tissue included between and beyond the ligatures. The author has observed that in sections stained with safranin the cells of the islands appear filled with granules, and further that solutions of silver nitrate injected into the main duct of a freshly-removed gland become reduced in these areas only. He concludes, therefore, that when the cells of the ordinary acini pass into the stage of the "islands of Langerhans" they undergo not only a morphological change, but acquire also chemical peculiarities.

An interesting observation has been made by Chauffard and Ravaut (*Arch. de Méd. Exper. et d'Anat. Path.*, Mars, 1901, p. 175). They found in 13 cases of typhoid fever that

the islands of Langerhans in the pancreas were swollen and of large size. In two cases of pneumonia and one of erysipelas a similar condition was noted. The writers do not look upon the lesion as pathological, but describe it as an hypertrophic reaction. I have been able to confirm this statement in more than one case of pneumonia, and found it well marked in a case of infective endocarditis. In deciding the question of enlargement of the islands it must be borne in mind that in young persons and children the islands are relatively more numerous and of larger size than in the adult.

ACCESSORY PANCREAS.

Glinski (*Virchow's Archiv.* 1901, Bd. 164, S. 132) classifies the anomalies met with in the pancreas as follows:—(1) *Pancreas minus*, in which a supernumerary lobe or lobule is present in the head of the gland separated by a more or less well-marked constriction. (2) *Pancreas accessorium*, in which isolated nodules of pancreatic tissue are found, usually in the walls of the stomach or intestine, occasionally even in the walls of intestinal diverticula. (3) *Pancreas divisum*, in which portions of the gland either of the head or tail may be found separated from the main mass of the gland, but still connected with it by the duct, the condition being ascribed to the mechanical pressure of blood-vessels on the developing gland. The first and third varieties in Glinski's classification scarcely merit the name of accessory pancreas, although they have been described as such by different writers. The first variety may be only an exaggeration of a normal condition, for Opie (*loc. cit.*) has pointed out that the head of the pancreas normally consists of two lobes, a larger and anterior lobe tributary to the duct of Santorini, and a smaller and posterior one corresponding with the duct of Wirsung. It is, however, to the second form that attention has been especially directed of late. Cases of this variety have been described by Nicholls (*Montreal Med. Journ.*, December, 1900) in the jejunum, by Wright (*Journ. of Boston Soc. of Med. Sciences*, 1901, Vol. V., p. 497), in the region of the umbilicus removed during life, and by Glinski (*loc. cit.*) in the posterior wall of the stomach. Ten cases have been collected by Opie (*loc. cit.*) from the records of 1800 necropsies performed in the Johns Hopkins Hospital,

and seven cases by Thorel (*Virchow's Archiv*, Bd. 173, Heft. 2, S. 281). The structure of these accessory nodules only differs from that of the normal pancreas in the greater number of the ducts seen, and in a greater tendency to chronic inflammatory changes. Islands of Langerhans have been demonstrated in them by Wright and by Opie (*Diseases of the Pancreas*, p. 56). The latter author has collected 22 cases from the literature. Of his own 10 cases, 7 were situated above the pancreas in the wall of the stomach or duodenum, and three below the pancreas in the wall of the duodenum or jejunum. Thorel states that the commonest site for their occurrence is in the wall of the stomach; Glinski on the contrary finds that they are most frequent in the small gut. The nodules usually lie in the muscular coat of the intestinal tract, occasionally in the submucosa, and more than one may be present in the same individual. An interesting point in connection with these accessory nodules is their occasional presence at the end of diverticula of the gut. Three such cases have been collected by Glinski. The older view that the diverticula were persistent Meckel's diverticula has had to give way to the theory of mechanical traction, since in Nauwerk's case an ordinary Meckel's diverticulum was present as well.

The development of these accessory pancreases, especially in view of their occasional multiplicity, has given rise to much speculation, as well as to the suggestion of the possibility of four original "*Anlage*" for the pancreas, two dorsal and two ventral, and even in some cases of a triple dorsal rudiment—a condition not known in any vertebrate species.

Opie in his recent work contends that the entrance into the wall of the gut, at an early period of development, of one or more embryonic buds of glandular tissue is a satisfactory explanation. Rudiments from the dorsal outgrowth, which is above the ventral, would be carried upwards towards the stomach; those from the ventral downwards towards the jejunum. This view is supported by the investigations of Helly (*Arch. f. mik. Anat.*, Bd. 52, S. 773), who has described the very frequent occurrence of pancreatic tissue in the substance of Santorini's papilla, such tissue occasionally possessing an independent duct and forming a true accessory pancreas. Helly has never met with a similar condition in

the biliary papilla, but Opie (*loc. cit.*, p. 54) describes such a case in which there was also an accessory pancreas in the jejunum.

PANCREATITIS.

Flexner (*University Med. Magazine*, Vol. XIII., 1901, p. 780) has shown that a large number of substances—artificial gastric juice, formalin, sulphuric and nitric acids, solutions of caustic alkalies, and suspensions of pathogenic bacteria (*B. pyocyaneus*, *B. diphtheriae*)—are capable of producing in the dog severe and often rapidly-fatal forms of inflammation, when injected into the pancreas either through the duct of Wirsung or directly into the parenchyma. The most common result was the production of the haemorrhagic variety, which ran a very acute course to a fatal issue, and was associated with fat-necrosis and glycosuria. In those cases in which a fatal result was longer delayed, necroses of portions of the gland, abscesses, and sometimes chronic interstitial pancreatitis were met with.

The problem, which remained unsolved, was whether the haemorrhage, which commonly accompanied all the forms of inflammation produced—sometimes so abundantly as to mask the inflammatory process—was antecedent to, and the cause of, the inflammation, or subsequent to it; or, again, whether the two conditions are independent affections, which are merely frequently coincident. Further investigations were consequently undertaken by Flexner and Pearce (*Univ. of Penna. Med. Bulletin*, Vol. XIV., p. 193). The injection of sterile blood (desfibrinated blood and blood-serum) into the duct and parenchyma of the pancreas of dogs did not cause acute inflammation; the tendency was for the rapid production of a chronic proliferative inter- and intra-acinar pancreatitis. These effects were not produced by blood-serum separated from the corpuscular elements. It was also shown experimentally that “perversion of normal secretions, such as bile and gastric juice, whereby they enter the pancreas, were efficient causes of pancreatitis.” Fat-necroses were found to attend all forms of pancreatitis, and were the more numerous and widespread, the more acutely the pancreatitis developed.

Mayo Robson (*Philadelphia Med. Journ.*, June 1, 1901) has also dealt with the subject of haemorrhage in pancreatic disease.

He states that, although there is undoubtedly some, as yet ill-understood, relation between pancreatic disease and serious haemorrhage, there is no reason why this fact should be allowed to influence our views on the pathology of Inflammation by the adoption of the term "haemorrhagic" pancreatitis in those cases where there has been no haemorrhage or not more than is met with in inflammations of other parenchymatous organs. The conclusions he has come to after a careful study of the subject are :—(1) That in certain diseases of the pancreas there is a general haemorrhagic tendency, which is much intensified by the presence of jaundice ; (2) that haemorrhage may occur in the pancreas unassociated with inflammation or with jaundice, or with a general haemorrhagic tendency ; (3) that both acute and chronic pancreatitis can and do frequently occur without haemorrhage ; (4) that some cases of pancreatitis are associated with local haemorrhage. Mayo Robson prefers to retain the term haemorrhagic pancreatitis merely as a variety of acute pancreatitis, the forms of pancreatic inflammation being divided into acute, subacute, and chronic. As to the cause of the local haemorrhagic tendency, he suggests the possibility that the glycerine set free in the tissues by the concomitant fat-necrosis may act as a causative factor. Experimental as well as clinical evidence is not wanting that glycerine may, and sometimes does, cause blood-destruction, as evidenced by haematuria or haemoglobinuria. The glycerine set free in this manner would, however, be very small in amount, and the elimination of its oxidation-products in the cases examined could not be demonstrated. It was, however, noted that there was a striking diminution in the number of blood-platelets in the blood of two cases of chronic pancreatitis.

Hess (*Münch. med. Wochenschrift*, 1903, No. 44, S. 1905) finds that glycerine injected into the main pancreatic duct of dogs does not produce any result upon the gland. Injections of olive-oil produce necrosis with haemorrhage, as well as fat-necrosis, or else chronic interstitial pancreatitis, according to the quantity injected. Hess considers it probable that olive-oil has some specific effect upon the gland—an effect possibly produced by the products into which it is split up by the pancreatic ferment, steapsin. To verify this hypothesis injections were made with fatty acids, with soda-soap solutions and

with glycerine. Oleic acid and 4-per-cent. soda-soap solutions were alike potent to produce pancreatic and fat-necrosis as well as haemorrhage. Glycerine-injections on the contrary had no effect except that the urine of the dog, two days after injection, contained sugar, which however quickly disappeared.

The author suggests the possibility of regurgitation of fatty substances from the intestine as a cause of human pancreatitis, such regurgitation being favoured by widening and injury of the biliary orifice by the passage of a gall-stone (the association of cholelithiasis and pancreatitis will be referred to later). He was unable, however, to produce any regurgitation experimentally.

To explain the cause of death, which takes place with all the signs of a grave intoxication both in man and in animals, Hess suggests poisoning by soap as the possible agent, and refers to the experiments of Munk and Friedenthal, who have shown that the injection of 0·1 grm. of soap pro kilo. into the blood-vessels of an animal produces collapse and death.

Opie (*Johns Hopkins Bulletin*, 1901, Vol. XII., p. 182) has collected 39 cases of haemorrhagic and gangrenous pancreatitis associated with gall-stones, either in the gall-bladder or in the bile-ducts. In 8 of these the calculus was found in the diverticulum of Vater. In an autopsy on a case of Halsted's, he found a small stone impacted at the orifice of the biliary papilla. The stone was too small to fill the diverticulum and so to occlude the opening of the pancreatic duct, and yet large enough not to pass through into the duodenum. The pancreatic duct was brightly bile-stained, and the gland showed haemorrhagic inflammation.

Here were present the necessary conditions for the conversion of the bile and pancreatic ducts into, so to speak, a common channel, and the bile-stained condition of the latter suggested the possibility that the entrance of bile into the pancreas was the cause of the haemorrhagic inflammation. This possibility Opie has verified by the injection of bile into the pancreatic duct of dogs, in every case with a positive result. Opie lays stress on the retrojection of bile as the causative factor in the production of acute pancreatitis. Such an occurrence, however, can only take place when the gall-stone is very small and the anatomical conditions of the duodenal orifice and the diverticulum of Vater are favourable,

which, as he has shown, is the case in about one out of every three individuals.

In this way can be explained the rarity of acute pancreatitis as compared with cholelithiasis. Interesting and important as this observation is in its bearing on the ætiology of human pancreatitis, the support lent to it by the experimental injection of bile into the pancreatic duct of dogs cannot be looked upon as absolute. It has been shown by more than one observer that the lower end of the biliary passages in the dog is normally the habitat of pyogenic bacteria. May not the experimental injection of bile and of other substances produce its effect by lowering the resistance of the walls of the pancreatic duct, and thus allowing the ready entrance of septic microorganisms?

Fuchs (*Deutsche med. Wochenschrift*, XXVIII. Jahrgang, 1902, S. 829) reports a case of suppurative pancreatitis, occurring in a man, aged 32, in whom a gall-stone was found at operation impacted in the diverticulum of Vater. The stone was removed, and the patient made a good recovery. Fuchs concludes that cholelithiasis is the most frequent cause of the hæmorrhagic, purulent and necrotising varieties of pancreatitis, and that the secondary chronic interstitial form occurs much more frequently in the course of cholelithiasis than has hitherto been thought.

Peiser (*Deut. Zeitsch. f. Chir.* 1902, Bd. 65, S. 302) reports an extremely interesting case of complete necrosis of the pancreas. The patient was a woman, aged 28, who, 2½ weeks after childbirth (normal labour, but placenta retained and removed manually with very severe, almost fatal hæmorrhage), was seized with sudden violent pain in the abdomen beginning in the region of the lower dorsal vertebrae and running towards the stomach, accompanied by bilious vomiting. On admission to the hospital 14 days later, she was found to have an abdominal tumour extending to the left under the ribs and downwards two fingers' breadths below the navel. The surface of the tumour was smooth and its consistence elastic; it was adherent to the liver; above it was the stomach, and below and in front of it the transverse colon, as ascertained by inflation of the bowel. The urine contained pus-cells, a trace of albumen, and 4 per cent. of sugar. The diagnosis of pancreatic cyst was made and operation decided upon. At operation a cystic swelling presented between the stomach and the transverse

colon. Gauze plugs were inserted round it, and 5 days later it was opened. Twenty to thirty c. cm. of turbid yellow fluid, containing large yellow shreds of material, were evacuated, leaving a hole 12 cm. long, filled with spongy tissue.

The fluid was faintly alkaline, and contained fat and albumen, but neither ferments, peptone, pus, nor sugar. Pyogenic bacteria were also cultivated, but slight suppuration had occurred around one of the plugs. The shreds of tissue were very necrotic and pigmented, and showed a faintly alveolar structure. A day or two later, on washing out the wound, the tip of a piece of tissue became visible, and on seizing it with forceps a longish irregular organ, 19 cm. long, 7 cm. in circumference, with a maximum breadth of 3 cm. and a minimum of 0·3 cm., was extracted. In size and shape it resembled the pancreas, and histologically it possessed an alveolar structure. The tissue was, however, completely necrotic, and contained much altered blood-pigment. Before this necrotic mass was removed, there had been much secretion from the fistula, but it never contained ferments or inflammatory products. The patient recovered, and the fistula closed, but she left the hospital with severe and progressive diabetes, which led to a fatal issue 4 months later.

The severe diabetes and the absence of ferments in the secretion from the fistula point, in the author's opinion, to the whole of the pancreas having been removed. The absence of inflammatory products in the secretion he holds as proof that inflammation was not the cause of the necrosis (the bacteria were regarded as a contamination from surrounding parts). The altered blood-pigment points to the necrosis having been secondary to haemorrhage, the result perhaps of the grave anaemia following the post-partum flooding. Pregnancy and parturition may have played their part, inasmuch as during this period toxines are either given freer play or are excreted with greater difficulty (*cf.* acute yellow atrophy of the liver, nephritis, eclampsia, &c.). Out of 121 cases of acute haemorrhagic pancreatitis in the literature Peiser finds that 48 were in women, whilst 8 of these occurred within 10 weeks of child-birth.

Brentano, Gusner and Lund have published cases of removal of pancreatic sequestra, but Peiser's case is the largest recorded.

Three of these cases that recovered occurred in women, and in all diabetes was present. Brentano's patient was alive 7 years after operation with advanced diabetes.

Peiser has only found one other case recorded in which pain in the lower dorsal region was a prominent symptom, and explains its occurrence by the pressure of the swollen pancreas on the solar plexus or by spread of the inflammation. Two cases of haemorrhagic pancreatitis, one in a woman aged 55, the other in a man aged 53, the latter associated with cholelithiasis, alcoholism and obesity, are also recorded in the same paper.

Selberg (*Berlin klin. Wochenschrift*, 1901, XXXVIII., S. 923) reports a case of pancreatic necrosis following the kick of a horse. The patient was a man, aged 39. He was kicked in the epigastrium and lost consciousness for a time. On recovering he suffered intense abdominal pain, which was followed latter by a swelling in the epigastric region. Dulness over the lower part of the left chest was also noted. Owing to persistence of the severe epigastric pain, the patient was sent to hospital on the 18th day after the injury. On admission, a doughy swelling was made out along the free border of the ribs on the left side and evidences of a left-sided pleural effusion were found. The abdominal symptoms were ascribed to perforative peritonitis, but no operative measures were undertaken owing to the hopeless condition of the patient, who succumbed two days later. *Post mortem* in addition to the left-sided pleural effusion, fat-necrosis in the omentum and gangrene of the head of the pancreas, with haemorrhage into the rest of the gland, were found.

Opie (*Journ. of Exper. Med.*, 1901, Vol. V., p. 397, and *Amer. Journ. of the Med. Sciences*, 1902, Vol. CXXIII., p. 845) has studied the causes and varieties of chronic pancreatitis. Affecting the undeveloped organ there is a syphilitic variety, characterised by great overgrowth of the connective tissue. Numerous islands of Langerhans were present in the thickened stroma, and some were in connection with the secreting structures of the gland, though the lumen of a duct could be traced no further than the periphery of the island. The cells of the acini present showed no evidence of degeneration, so that the condition appears to be primarily a disease of the connective

tissue. Of the adult gland two types of chronic pancreatitis can be distinguished : (1) inter-lobular, (2) intra-lobular. In (1) the fibrous tissue lies between the lobules and only penetrates into the acini in very advanced cases ; in (2) the fibrous tissue penetrates between the acini and early invades the islands of Langerhans. Since Opie holds that upon the condition of the islands of Langerhans depends the occurrence or not of diabetes mellitus, it will be seen that with the second form of chronic pancreatitis diabetes is the rule, and that with the first form it is only present when the lesion is very advanced.

Chronic pancreatitis is slightly more common in men than in women. Its most frequent cause is obstruction to the duct due to biliary calculi, pancreatic calculi, or carcinoma of the head of the pancreas, aided in some instances by the action of microorganisms. Without obstruction the lesion may be due to ascending infection of the duct following acute catarrh of the duodenum or bile-duct. Following duct-obstruction or ascending infection of the duct the chronic inflammation is usually of the inter-lobular type and only secondarily invades the acini and islands of Langerhans. Associated with portal cirrhosis of the liver, haemochromatosis, "hyaline degeneration" of the islands of Langerhans, and general arterio-sclerosis, the chronic interacinar form of inflammation, invading the islands, is met with. In nine of Opie's cases of chronic interacinar pancreatitis diabetes was present ; in the remaining two, in which it was absent, the lesion was slight and the islands were only slightly involved.

To Mayo Robson (*Lancet*, Vol. II., 1900, p. 235) is due the recognition of the importance and the successful treatment of chronic pancreatitis. The onset may be gradual and painless, or may resemble a gall-stone attack and be followed by jaundice. The pain, however, is central, and passes backwards to the mid-scapular region or round to the left. The tender spot is in the mid-line, 1 inch above the umbilicus, not over the gall-bladder. The pain may be paroxysmal, or a deep-seated dull ache. Jaundice, though not an early symptom, is usually present at some period of the disease, and when it comes on tends to deepen with each attack and to become chronic. Loss of strength and flesh are present in all cases :

vomiting, dyspepsia, diarrhoea with fatty and offensive stools, albuminuria, and glycosuria are frequent symptoms. With the absence of the pancreatic juice alone from the intestine, the stools may be white.

Fever is often absent but may occasionally run a hectic course. In the later stages of the disease, if jaundice is present, there may be haemorrhages from the nose, stomach and bowels, or into the skin. In some cases the gall-bladder may be greatly distended, as it is in cancer of the head of the pancreas, for which disease chronic pancreatitis is apt to be mistaken. The author discusses the diagnosis of the disease from gall-stones in the common duct, cancer of the head of the pancreas, cancer of the liver and bile-ducts, and chronic catarrh of the bile-ducts. For details on these points the reader is referred to the original article. The treatment of the condition is by cholecystotomy, which drains the bile-ducts, relieves tension, and thus indirectly drains the pancreatic duct. Gall-stones, if present, should be removed. In all cases of deep jaundice Mayo Robson administers chloride of calcium in 20-grain doses thrice daily for 24 or 48 hours before operation, and in 60-grain doses in enema-form for 24 hours three times a day after operation.

In a subsequent paper already referred to (*Philadelphia Med. Journ.*, June 1, 1901) Mayo Robson mentions one test, devised by Cammidge, which promises to be of great assistance in the diagnosis of chronic pancreatitis. The actual details have not yet been published, but the outlines of the test are as follows:—The urine from a suspected case “is boiled for a short time with an oxidizing agent and the phenyl-hydrazine test performed, when an abundant crop of delicate yellow needles arranged in sheaves and rosettes is produced.” The untreated urine gave no such result, nor did normal or gouty urines, or bilious urine from patients suffering from simple catarrhal jaundice.

THE PANCREAS IN CIRRHOSIS OF THE LIVER.

Klippel and Lefas (*Revue de Médecine*, No. 1, 1903, page 23) report eight cases of cirrhosis of the liver, in which the condition of the pancreas was carefully examined. They find that in cases of portal cirrhosis the pancreas is frequently affected by an overgrowth of either the intralobular or inter-acinar

connective tissue. The size of the organ varies ; but should an atrophy, recognisable by the naked eye, be present, the body and splenic end of the gland are the parts chiefly affected by it. The authors find it difficult to determine the priority of the lesions met with in the liver and pancreas in cases of portal cirrhosis. As a general rule, the liver is more seriously affected by the sclerosis, but by no means constantly so ; in some cases the lesion is more severe in the pancreas, in others it is equally marked in both glands. In every case, however, even when the newly-formed fibrous tissue in the liver is of semi-adult type, the fibrous tissue in the pancreas is fully formed and poor in nuclei. They conclude that the term cirrhosis of the liver is but the designation for a single lesion of a malady, which, at the same time as it affects the liver, makes itself felt on the gastro-intestinal glands, the spleen, and the pancreas.

Steinhaus (*Deutsch. Archiv f. klin. Med.*, Bd. 74, Heft 5 and 6, S. 537) has also studied the condition of the pancreas in 12 cases of cirrhosis of the liver, and comes to the following conclusions :—(1) In 11 out of 12 cases (the exception being a case of typical Laennec's cirrhosis), the interstitial tissue of the pancreas showed a typical inflammatory proliferation, comparable in every way with that met with in the liver. (2) The changes found were either a peri-lobular, or a peri-lobular and peri-acinar cirrhosis, which, when advanced, caused considerable destruction of the gland-parenchyma. The presence of foci of small cells, together with proliferation of the capillaries and ducts, justifying the designation of the condition as an interstitial pancreatitis. (3) In 11 of the 12 cases, the islands of Langerhans were unchanged. (4) The occurrence of true diabetes mellitus in cases of cirrhosis of the liver, whether associated with haemochromatosis or not, as well as the diminished tolerance for sugar shown by the subjects of this disease, is to be attributed, not to the lesion of the liver, but to that of the pancreas. (5) The fact that diabetes does not occur in all cases of cirrhosis is to be explained, in view of Minkowski's experiments, by the escape from destruction of a sufficient portion of the gland. Steinhaus is further of the opinion that the occurrence of cirrhosis of the pancreas in cases of cirrhosis of the liver, lends additional support to the attempt to simplify and to unite under one single head, viz., disturbance

of the function of the pancreas, the complex pathogeny of diabetes mellitus.

WOUNDS OF THE PANCREAS.

Küttner (*Beitr. z. klin. Chir.*, Bd. XXXII., S. 244, 1901) reports an interesting case of a stab-wound of the pancreas successfully treated by surgical suture. The patient, a man 24 years old, received a violent blow from a long-bladed and recently-sharpened knife in the left hypochondrium, the direction of the stab being from below upwards.

Within a quarter of an hour after receipt of the injury the patient was on the operating table. An abdominal wound 14 cm. long was seen, through which protruded the stomach, transverse colon and several loops of the small gut. The knife had slit open the anterior wall of the stomach, cut the left costal margin, and notched the left border of the liver; then, after penetrating the lesser omentum, it had entered deeply to the left of the vertebral column. In this situation both arterial and venous blood was welling up freely, and it was found that the pancreas had been transfixated just to the left of the tuber omentale. Two deep and one superficial catgut sutures were inserted into the parenchyma of the gland, and the haemorrhage was thereby checked. The bursa omentalis was plugged, and the stomach-wound sutured. The patient recovered, although at first he was gravely ill, with symptoms of threatening collapse and subphrenic abscess.

In the treatment of wounds of the pancreas Küttner recommends suture in preference to plugging; but care must be taken that the sutures are not so deeply inserted as to wound the superior mesenteric artery.

PANCREATIC LITHIASIS.

Kinnicutt (*Amer. Journ. Med. Sciences*, vol. CXXIV., No. 6, p. 948) discusses the question of pancreatic lithiasis, and reports a very interesting case. From the literature he has been able to collect only six cases in which a positive diagnosis of pancreatic calculi was made, or the condition suspected during life. To these six, however, must be added another—the first in which a diagnosis of calculus of the pancreas was followed by a successful operation—recorded by Moynihan (*Lancet*,

Vol. II., 1902) and referred to by him in a recent number of THE PRACTITIONER. Kinnicutt's patient was a lady, aged 42, who had had three attacks of sudden severe pain, beginning in the back and running round the right side along the lower intercostal spaces, with nausea and vomiting. After an interval of eight months, another extremely severe attack occurred. The pain began as before in the back between the scapulae, but on this occasion it ran *through*—not round—into the epigastrium, and became localised to the right of the middle line. On the sixth day after the commencement of the attack six small stones, the size of a pea, were passed *per rectum*. Four of these were analysed and found to be composed of carbonate and phosphate of lime with no trace of cholesterin or bile-pigment, thus indicating their origin in the pancreatic ducts. Similar stones or detritus of similar composition were recovered from the stools during more than one subsequent attack of colic. Some of the patient's later attacks were associated with jaundice, and on one occasion two typical gall-stones were recovered from the stools. This case, the author points out, shows the difficulty there is in distinguishing between the presence of biliary and pancreatic calculi. There is nothing distinctive in the nausea, vomiting, diarrhoea, character of pain, presence of abnormal quantities of muscle-fibres in the stools, or jaundice. The points which are helpful, are the finding of the calculus and its analysis, glycosuria, and a deficient splitting of ingested fats into fatty acids and soaps. According to Müller and others 75·8 per cent. of the fat in the stools is split up and appears as fatty acids or soaps, not as neutral fat. This last occurs in jaundice and other pathological states, but not in cases in which the pancreatic secretion is diminished or prevented from reaching the intestine. In such cases the decomposition into fatty acids and soaps is greatly diminished. The average amount split up in three such cases was only 39·19 per cent. instead of 75·8 per cent. (This statement has been contested by Deuscher and Albu.) In the case described fat-absorption was normal, but of the fat recovered from the faeces 42·6 per cent. was in the form of neutral fat—an amount according to Müller, much in excess of the normal, and indicating at least a diminished flow of pancreatic secretion into the intestine,

TUMOURS.

Primary tumours of the pancreas are far from common, and those that are found are usually malignant. Nicholls (*Journ. of Med. Research*, Vol. VIII., No. 2, p. 385), however, has described a specimen of simple adenoma arising from an island of Langerhans. The growth was a small, rounded, and somewhat flattened nodule on the anterior surface of the pancreas, situated at about the junction of the middle and terminal thirds. Its colour was tawny-yellow, and on section it was found to be soft, but sharply circumscribed. The whole nodule was not larger than a marrowfat pea. Microscopically, the tumour was composed of a stroma of connective tissue arranged in the form of imperfect and irregular alveoli, in the interstices of which were cells of glandular type forming masses and wavy bands. As compared with acinous cells, those of the tumour were smaller, their nuclei were relatively larger, and their cytoplasm was looser in texture and stained more faintly and irregularly. The encapsulation and lack of tendency to infiltrate proclaimed the tumour a simple adenoma. From its staining-reactions, especially with Mallory's connective-tissue stain, with which it took on a brownish colour like the islands of Langerhans instead of a steel-blue like the rest of the gland, Nicholls thinks that the starting-point of the growth was an island of Langerhans. Of the four cases which the author has collected of adenoma, only two are above suspicion. The only possible points of origin for adenomata in the pancreas are (1) the epithelium of the ducts, (2) the glandular acini, (3) the islands of Langerhans, and (4) adrenal rests.

Kakels (*American Journ. of Med. Sci.*, Vol. CXXIII., No. 3, p. 471, 1902) has made a study of primary sarcoma of the tail of the pancreas. Out of 21 cases of sarcoma of the pancreas collected from the literature, of which only 10 can be said to be truly cases of primary sarcoma, only 4, including the author's case, were found in the tail of the gland. The symptoms produced are merely those of pressure, together with rapid emaciation and weakness. Sugar may be present in the urine, if much of the gland is destroyed. The author's case occurred in a woman, aged 51, who had been ill for six months with pain and heaviness in the left hypochondrium, radiating

downwards. She had lost flesh, and had noticed a gradual swelling of her left side, but had had no vomiting or dyspeptic symptoms. On examination an abdominal tumour was discovered extending from below the ribs on the left side to a line 5 cm. below the navel. In breadth it reached from the linea semilunaris out into the lumbar region, and was dull except over an area corresponding with the descending colon. It was slightly moveable, non-adherent to the abdominal wall, and gave a sense of semi-fluctuation, on which account it was aspirated, blood and shreds of connective tissue with small round cells being withdrawn. A blood-examination showed a moderate leucocytosis, but "the cells showed no evidence of splenic disease, and therefore tumour of the spleen was excluded." A diagnosis of sarcoma of the kidney was made (the urine contained albumen, a slight amount of blood, epithelial casts and a number of small round cells). An operation for its removal proved impossible, and the patient succumbed shortly afterwards. *Post mortem* a mixed-celled sarcoma of the tail of the pancreas was found, the growth being very vascular. The kidneys were granular. Of the three cases collected from the literature, that of Witzel is not positively a primary growth, as no post-mortem examination was permitted. According to Kakels, therefore, the case makes only the third authentic case of primary sarcoma of the tail of the pancreas recorded.

THE URINE IN DISEASES OF THE PANCREAS.

Examination of the urine may yield important clues as to the presence of pancreatic disease. Cammidge's test, which has already been mentioned, promises to be of the greatest help in the diagnosis of chronic pancreatitis. Edsall (*American Journ. of Med. Sci.*, April, 1901) considers that a diminution of the amount of ethereal sulphates in the urine may also be an indication of pancreatic disease, for the following reasons:—The products of proteolytic digestion are readily decomposed by bacteria, whilst native albumen is not. If, therefore, there were little or no proteolytic digestion going on in the intestine, as is the case in severe lesions of the pancreas, the products of bacterial activity would be lessened, and the quantity of ethereal sulphates in the urine should be decreased. In

attributing a decrease in the amount of ethereal sulphates excreted to disease of the pancreas, many other factors must first be taken into consideration. If the patient has diarrhoea or gastric hyperchlorhydria, or is being fed on milk only, or on any other diet which reduces bacterial activity, then a relative diminution in the ethereal sulphates is of little value. Further, if the quantity of inorganic sulphates excreted is small, a diminution in the quantity of the ethereal sulphates is of no importance. If, however, disease of the pancreas be suspected, and a reduction in the quantity of the ethereal sulphates be found, although none of the conditions mentioned be present, then the test may be of great use in diagnosis. The test becomes the more important, if positive, in the presence of constipation, deficiency or absence of gastric acidity, jaundice, severe anaemia, or cachexia, all of which conditions tend to increase the amount of ethereal sulphates in the urine.

Opie (*Johns Hopkins Hosp. Bulletin*, May 1902, p. 117) has suggested another test, which may be of use in the diagnosis of acute lesions of the pancreas. Since it has been definitely shown that the disseminated fat-necrosis associated with acute lesions of the pancreas is due to the action of the fat-splitting ferment of the pancreatic juice, the presence of which has been demonstrated by Flexner in the areas of necrosis, it occurred to Opie that this ferment, which is free in the tissues, might be excreted by the kidneys. The urine obtained after death from a case of haemorrhagic pancreatitis in a man, aged 28, was examined for the ferment by the method of Castle and Loevenhart, which depends upon the decomposition by the ferment of purified ethyl butyrate, with the formation of butyric acid. The urine was neutralised with potassium hydroxide and divided into two parts, to one of which was added a few drops of ethyl butyrate together with a small quantity of litmus-solution. The second part, used as a control, was boiled to destroy the ferment, if present, and ethyl butyrate added. Both specimens were kept at 37° C. At the end of twenty-four hours the unboiled specimen had acquired a well-marked acid reaction, while the control specimen showed little, if any, change. Owing to the small quantity of urine available, the test could not be repeated, and Opie describes it in order that its accuracy may be verified in other cases,

THE RELATION OF DISEASE OF THE PANCREAS TO
DIABETES MELLITUS.

Ssobolew in 1900 (*Centralbl. f. allg. Path. u. Path. Anat.*, Vol. XI., S. 202) reported two cases of diabetes mellitus, associated with chronic pancreatitis, in which no traces of the islands of Langerhans could be found in the pancreas. Opie, in his paper on chronic pancreatitis in the *Journal of Experimental Medicine*, already cited, noted that only when the fibrosis involved the islands of Langerhans, was diabetes present, and that, as would be expected, this disease was more commonly associated with chronic intra-acinar pancreatitis, with or without hæmochromatosis, inasmuch as in this form the islands are early involved. In a subsequent paper by the same author (*Journ. of Exp. Med.*, 1901, Vol. V., p. 527) the extremely interesting association of hyaline degeneration of the islands of Langerhans alone with diabetes mellitus was reported, and from this paper may be dated the revival of the study of the pancreas, and especially of the islands of Langerhans, with reference to the part it plays in the metabolism of the carbohydrates. The hyaline material, according to Opie, conducts itself towards Van Gieson's stain, as does, according to Ernst, hyaline material of epithelial origin, and the author looks upon the change as occurring in the cells themselves. Wright and Joslin (*Journ. of Med. Research*, Vol. I., p. 360) have found 2 cases of hyaline degeneration of the islands out of 9 cases of diabetes.

Weichselbaum and Stangl (*Wien. klin. Wochenschrift*, 1901, No. 41, S. 968) have studied the pancreas in 18 cases of diabetes, and found it affected in 17. The changes were especially marked in the islands of Langerhans, and consisted in :—(1) Diminution in the number or size of the islands; (2) special alterations in the islands themselves, which were divisible into three classes :—(a) Marked attenuation of the cellular protoplasm, which was sometimes only represented by filaments or granules; (b) diminution of the size of the cell-body, so that the nuclei were more closely approximated and appeared often smaller, more oblong, and more deeply staining; (c) increase in width and hyaline transformation of the stroma of the islands, so that they resembled degenerated renal glomeruli. The authors regard the pancreatic changes in their

cases as a process of atrophy of unknown origin, which more especially affects the islands of Langerhans.

Hertzog (*Virchow's Archiv.*, 1902, Bd. 168, Hft. 1, S. 83) agrees with Weichselbaum and Stangl, and regards the changes in the pancreas in cases of pancreatic diabetes as of the nature of a specific atrophy of unknown origin, which affects the islands in different ways, inasmuch as at one time they disappear by hyaline degeneration, at another by connective-tissue proliferation.

In five cases of diabetes, chronic interstitial pancreatitis of the inter-acinar variety was present in 4, whilst in the remaining case there was an unevenly-distributed inter-lobular fibrosis, which, however, was of an advanced degree in the areas in which it was present. In 3 of these cases the islands were diminished in number, and either surrounded by a thick fibrous investment, or else invaded by fibrous tissue. In 1 of the remaining 2 cases the islands were the seat of hyaline degeneration, whilst in the other no trace of them could be found in several hundred sections examined, their place being apparently taken by small nodules of connective tissue.

Schmidt (*Münch. med. Wochenschrift*, 1902, No. 2, S. 51) has examined 23 cases of diabetes. In 8 the pancreas showed no changes, and in 8 others the changes which were present were so slight as to be considered secondary to the diabetic condition; in 16 cases, therefore, out of 23 there were either no changes in the pancreas or the changes were so slight that they were probably not in any way causal. In one of the remaining cases there was hyaline degeneration of the islands, which the author considers primarily affects the walls of the capillaries, and is not of epithelial origin. In another case—a child, aged 10 years, whose urine contained 6·8 per cent. of sugar—there was an acute interstitial inflammation limited to the islands, and 2 other cases were associated with chronic interstitial pancreatitis of the inter-acinar variety so seriously involving the islands that many of them were converted into connective-tissue balls resembling fibrosed glomeruli. Schmidt is of opinion that these cases all speak in favour of some sugar-burning function being that of the islands of Langerhans; but he thinks that this statement must be made with reserve, for positive observations are still too few. He himself has met

with cases, which cannot be made to harmonise with this supposition, for in two of his remaining cases, in which chronic interstitial pancreatitis was present, the islands were found in such large numbers, and were so markedly developed, that they formed the greater part of the remaining parenchyma. In both cases the pancreatitis followed duct-obstruction, and in both the islands only differed from the normal in that in some of the larger ones there was a rather more evident connective-tissue stroma, and in some of the smaller only one capillary vessel was present instead of a network. Schmidt regards the increase in size and number as an indication of a new formation of islands from gland-acini, but is doubtful whether such newly-formed islands are identical with old ones as regards their functional capacity. If the islands in these cases resemble normal islands in functional capacity as well as structure, then, since diabetes and chronic pancreatitis were present in both, the important rôle ascribed to the islands in the metabolism of the carbohydrates cannot be justified. If, on the contrary, these islands are incapable of normal function, the two last cases described cannot be cited as an objection to the view that the function of the islands of Langerhans is to burn sugar.

Ssobolew (*Virchow's Archiv.*, Bd. 168, 1902, Hft. 1, S. 91) is a warm supporter of the separate entity of the islands and of their importance in carbohydrate metabolism. From experiments on 33 rabbits, 14 dogs, and 12 cats, in which fibrosis of the pancreas was produced by obstructing the duct in different ways, the author found that the islands were extremely resistant to the fibrotic process. Mankowski's objections to Ssobolew's methods have already been cited. If portions of the gland were transplanted, Ssobolew found that the glandular parenchyma disappeared, but that the islands of Langerhans were extremely resistant and were capable of preventing the onset of diabetes. From an examination of the pancreas of human and animal embryos, it was found that the islands were apparently formed at an earlier period than the secreting acini of the gland. In 17 cases of pancreatic sclerosis and 1 of lipomatosis the author found the islands very resistant. In 15 cases of diabetes—6 of which were severe—and 1 of acute glycosuria, the islands were only normal in 2, in 4 they could not be found, in 9 they were much diminished in number and

in some instances showed fatty degeneration. In the case of acute glycosuria, which followed an attack of gastro-enteritis, the pancreas showed parenchymatous degeneration and partial necrosis. The islands throughout were markedly degenerated, and stained badly even in those parts of the gland which were best preserved. Ssobolew suggests that the administration, by the mouth, of the pancreas of newly-born calves, in which the islands are plentifully developed, might afford better therapeutic results in diabetes than ordinary pancreas, the use of which has hitherto not been satisfactory.

Weichselbaum and Stangl in a subsequent paper (*Wien. klin. Wochenschrift*, 1902, Nr. 38, S. 969) have described in detail their investigations of the pancreas in 17 additional cases of diabetes, 2 of which were not considered clinically to be of pancreatic origin. The methods employed in this second series of experiments render the results obtained less open to criticism, inasmuch as the pancreas was examined as soon as possible after death, and the varying number of islands present in the head, body, and tail, as pointed out by Opie, was borne in mind. The changes present were most marked in the islands, and were as follows :—(1) Diminution of the number of the islands in all cases ; (2) simple atrophy of the cells of the islands, together with (3) vacuolisation and liquefaction of the cell-protoplasm ; (4) sclerosis, associated sometimes with hyaline change, haemorrhage, or calcification, and always leading to destruction of the islands. The most frequently found of these varieties were simple atrophy and vacuolisation, &c., whilst sclerosis was met with only 4 times in the 17 cases. In one and the same case 2 or more of these varieties would be found together, and 2 of them might even occur together in the same island.

The intensity and extent of these changes was variable. In some specimens very many islands were affected ; in others relatively few, and many sections would have to be examined before finding them. In most cases one or more islands were unaffected. The relation of the extent and degree of the changes present to the length of the disease could not be definitely determined.

In neither of the 2 cases of glycosuria, which were clinically thought not to be of pancreatic origin, were any changes found

in the islands. After discussing at length the various views for and against a causal relationship between disease of the islands of Langerhans and diabetes, the authors support the theory for the following reasons:—(1) In all cases of pancreatic diabetes changes are found in the islands of Langerhans, sufficient to impair their function, such changes being absent in cases of glycosuria of other origin. (2) The lesions present in the rest of the pancreas are so slight or so insignificant as to be insufficient to cause diabetes. (3) Cases of glycosuria in which careful search fails to find *any* change in the islands, always admit of an explanation which is compatible with the theory above mentioned. (4) Upon embryological and histological grounds it is probable that the islands have quite a different function from that of the rest of the gland-parenchyma. (5) The experiments of Ssobolew and Schultze, and the examination of the pancreas of non-diabetics, show that the islands behave quite differently to the agent producing pancreatic diabetes from the way they do to the insults which evoke the other forms of pancreatic atrophy.

Jean Lepine (*Lyon Médical*, 1903, No. 43, p. 623) reports 2 cases of diabetes in which the islands of Langerhans were affected in a similar manner to that described by Weichselbaum and Stangl. In both there was fibrosis of the pancreas—in one of long standing, in the other of more recent date. In the former the islands were surrounded and in places partially destroyed by well-formed fibrous tissue; in the latter the lesion was very marked in the islands, many of which showed hyaline degeneration.

Von Hansemann (*Verhandl. der Deutschen path. Gesellsch.*, 1902, Bd. iv., S. 187) comes to the conclusion that there is no relation between disease of the islands and the occurrence of diabetes. In the 34 cases of diabetes examined by him, the islands were not once absent. In some cases in which nearly the whole parenchyma was destroyed either by fat or advanced interstitial fibrosis, the islands, as would be expected, were few, but even in these cases some islands were present and *unchanged*. In 6 cases only were the islands traversed by hyaline connective tissue, although not all the islands were so affected; and since an interstitial fibrosis was present in the gland, it appeared to be a matter of chance whether the

fibrosis affected the islands or not. In no cases were the islands alone affected. On the other hand, v. Hansemann states that he has not met with a case in which the fibrosis affected the islands without diabetes being present.

The impetus, which Opie's paper has given to the study of the islands of Langerhans in cases of diabetes, tends at the present time to give undue prominence among recorded cases to those in which "disease of the islands" is present. As has been shown, not all observers agree as to the separate entity of these structures. It seems to the writer, therefore, that further research in this direction, and moreover further study of the islands in diseases other than those associated with glycosuria, is needed before a definite part can be assigned to the islands of Langerhans in the complex pathogeny of diabetes mellitus.

Postscript.—Since the above review was written Dr. Cam-midge has described in the recent Arris and Gale Lecture before the Royal College of Surgeons his method of examining the urine in cases of suspected pancreatic disease. For full details of the test, which is somewhat complicated, the reader is referred to *The Lancet*, Vol. I., 1904, p. 783.



A CASE WITH COMMENTS.

RUPTURED OVARIAN CYST ; OVARIOTOMY ; DEATH IN
NINE MONTHS FROM PERITONEAL SARCOMA.

By RICHARD ALCOCK, M.D.,

Hon. Medical Officer, Gooch Cottage Hospital.

THE following case occurred in my practice recently, and I read an account of it before the Leeds and West Riding Medico-Chirurgical Society, when more than one member advised me that the case was of sufficient interest to be worthy of publication.

The patient was a young unmarried woman of 34, living in the lowest class of life ; she had borne a child many years ago, and was, at the time when she came under observation, cohabiting with a man. During the year 1902 her abdomen enlarged, and by December had attained such a size that no doubt was entertained by her neighbours that she was pregnant and near full time. One day she got a blow in the abdomen from the handle of a washing-machine ; she was seized with most violent pain, and her abdomen swelled enormously and very rapidly.

The following day, Sunday, December 14th, I was called to see her, and found her abdomen distended to its utmost capacity, the skin glossy and thinned, giving the impression of being upon the point of rupture ; she was in severe pain, referred to no particular part of the abdomen, but described vaguely as "all over the body" ; the face was drawn and anxious ; she lay on her back with the thighs flexed ; the pulse was weak, rapid and fluttering ; urine almost entirely suppressed ; tongue dry : in short, she was very ill indeed.

The abdomen was universally fluctuant ; and percussion gave a dull note almost all over it. When, however, she was rolled over on to her side the uppermost flank became resonant, which pointed of course to free fluid in the peritoneal cavity. But when she lay on her back, there was no anterior area of

resonance. A catheter was passed, and drew off less than an ounce of urine, proving the anterior dulness not due to a distended bladder. There were no signs of pregnancy ; menstruation had been somewhat irregular, but had occurred within a fortnight previously ; there were no breast-signs ; and vaginal examination was also negative, the cervix being hard, conical and movable.

A more careful percussion revealed areas of resonance on the sides of the abdomen, about midway between the anterior and posterior mid-lines. That is, there was bowel-resonance below the level of liquid dulness, which seemed to me to be capable of explanation only on the assumption that there was something—a distended bladder, a pregnant uterus, or a tumour—occupying the anterior part of the abdomen, and displacing the bowels laterally, preventing their floating up to the highest part of the abdominal cavity.

These resonant areas, further, were elusive, being sometimes found and sometimes not, as the patient was moved about, proving that the bowels were not adherent to the sides.

A diagnosis was arrived at of ovarian tumour, with additional free peritoneal fluid.

I had her removed to the Goole Cottage Hospital. A consultation of the whole staff took place, and there was a general agreement in opinion.

In hospital, her condition improved ; the pulse steadied and got stronger ; the kidneys began to act more freely, and the extreme degree of distension of the abdomen passed off. Operation was therefore deferred for a few days. On December 21st, I opened the abdomen, when a large quantity of clear, slimy, yellowish fluid, resembling raw white of egg, escaped from the peritoneal cavity. Its appearance irresistibly reminded all of us who were present of the contents of an ovarian cyst. The ovarian tumour now presented ; attempts were made to tap it without any great success ; the incision in the abdominal walls was extended, and the whole tumour delivered through it. The pedicle presented no special difficulty, but was rather broad ; it was ligatured, and the tumour cut away. The abdomen was flushed out and dried with sponges ; and the wound was sutured without a drain, and dressed.

The tumour was a multilocular cystadenoma of the left ovary, in which no one cyst was of predominant size. It measured some 12 inches in its long axis by 7 inches in its short. It appeared in no way remarkable; there were no intra-cystic papillomatous growths found; the cyst-walls were fibrous and firm, and there was no suggestion of malignancy about it.

The right ovary was normal and was not removed.

The after-history of the operation was quite uneventful, and the patient left the hospital in about three weeks.

I had occasion to see her from time to time at her own home, and was sorry to see that the very marked improvement in her general appearance which had taken place in hospital was not maintained. She got paler and thinner and complained of headaches. I attributed this to her very squalid surroundings.

After some months, on September 18, 1903, I was called to see her, and found her emaciated and anaemic, and suffering from very frequent vomiting. I was informed that she had retained no food for a fortnight.

Physical examination revealed nothing, except some fulness of the abdomen. No disease of lungs or heart could be detected, but the abdomen was somewhat tender to pressure. No very careful examination was possible where she was, and no improvement in her condition at all probable unless she were better attended to. I, therefore, had her removed to the Union Infirmary under the care of my friend and colleague, Dr. Blair. He informed me that he found a small tumour of the right ovary, but that her condition was too bad to justify any operation for that. On October 3 she died. On October 4, by the kindness of Dr. Blair, I was permitted to make a partial necropsy.

On opening the abdomen, about a pint of clear watery fluid escaped. The whole abdominal cavity was occupied by a white friable tumour-mass, imbedded in which the viscera lay. On more careful examination it was noticed that one flat cake represented the great omentum; it took its origin from the greater curvature of the stomach and lay in the abdomen superficial to the small intestines and reached down to the pubes. On raising it up from below, the transverse colon was

seen to traverse its deeper aspect. It was some two inches thick at its upper part and tapered off to its free edge. Its anterior surface was quite smooth. The growth seemed purely peritoneal in distribution and to be universally present all over the peritoneum ; larger masses occurred where refoldings took place, as at the omentum, appendices epiploicæ, and right broad ligament.

In this last situation a more definite, rounded mass could be distinguished, which was clearly a tumour of the right ovary. This was about the size of a small orange and contained scattered cysts with a smooth lining, the largest of which was perhaps the size of a pea.

Microscopically, the new growth was a round-celled sarcoma ; but in the ovarian tumour, especially lining the small cysts, some more or less unaltered ovarian stroma could still be distinguished. Nowhere could any alveolar structure be discerned ; nowhere was anything of the nature of a papilloma. The growth was homogeneous and traversed by large blood-vessels with little of definite walls of their own, appearing practically a blood-channel through the growth.

Comment.—The chief interest in this case lies in the fact of the involvement of the peritoneum in a universally distributed sarcoma, and death from that cause, nine months after ruptured ovarian cyst. That papilliferous cystomas are infective is clearly recognised, papillomata appearing scattered over the peritoneal lining by implantation ; but that sarcoma should follow, suggests that we have here an argument in favour of the more genuine infectivity of malignant disease by some parasitic agent.

On the other hand, it is quite open to argument that the sarcoma of the right ovary was an independent new formation, and had no connection with the cystadenoma of the left ovary ; and that the remainder of the intra-abdominal new growth was secondary to sarcoma, and was not due to infection by the ruptured cyst. Against this view is to be considered the disposition of the new growth, limited as it appeared to be to peritoneum. The liver, for instance, had new growth all about it on its surface, but, on cutting its substance, no nodules were found in its interior, as one would have expected to find in a case of metastatic involvement.

Whatever may be the explanation, it appears to me that the facts are worth putting on record, and the inference provisionally being drawn, that ovarian cystic fluid should not be allowed to escape into the peritoneal cavity. Hence it follows that in ovariotomy, performed as it usually now is on tumours of moderate size, it would be safer not to attempt tapping at all, but to deliver the tumour entire through the abdominal incision.



Public Health.

THE PROVISION OF SANATORIA FOR LONDON CONSUMPTIVES BY THE METROPOLITAN ASYLUMS BOARD.

By LOUIS PARKES, M.D., D.P.H.,

Medical Officer of Health for Chelsea; Consulting Sanitary Adviser to H.M. Office of Works.

ON the 28th November 1903 the Managers of the Metropolitan Asylums Board, having considered the question of the proposed establishment of sanatoria for consumptive patients, were of opinion that the matter is one of such vital and far-reaching importance to the community at large, and the proposal one which, if adopted by the managers, would entail so considerable an extension of their duties and responsibilities, and so large an increase in their expenditure, as to call for some authoritative expression of opinion by the chief health authority of the country, viz., the Local Government Board, before the managers are asked to take any definite action in the matter, or to make any further inquiries in regard thereto. The matter is, therefore, shelved for an uncertain period, but in the meantime it may be of interest briefly to review the various arguments that have been advanced in support of, or in opposition to, the proposal. The question may be broadly considered in (1) its charitable, (2) its economic, and (3) its public-health aspects, although all three aspects are to a certain extent interwoven, and cannot be definitely separated from each other.

(1) As a charitable measure, the provision of open-air sanatoria holds out the prospect of a more hopeful mode of treatment for the poorer class of London consumptives than is available for them at the present time. The general hospitals in London are averse to the reception of phthisical patients for any but short periods; nor are such patients, as a rule, very materially benefited by stay in the wards of the general hospitals. The special hospitals for consumption in London are too few to be able to deal with more than comparatively

small numbers of such cases ; and moreover, although London hospitals, they receive considerable numbers of patients from the country and from extra-metropolitan districts, so that there is often a long period of delay after application before a case is admitted. The wards of the workhouse infirmaries receive a very large number of cases from amongst the poor, but they do not, as a rule, seek admission until they find that they are unable to continue their occupations, and they are then generally in an advanced and incurable stage of the disease. The provision of open-air sanatoria, where gratuitous treatment would be supplied, would, then, supplement the existing hospital administration of London in a direction where charitable effort could rightly be invoked.

One of the main difficulties in this connection is as to whether it will be possible to secure the cases arising amongst the poorer classes of the community in a stage of the disease sufficiently early for them to derive the greatest amount of benefit from sanatorium treatment. Nearly all authorities are now agreed that, effectually to arrest the progress of tubercular phthisis, it is necessary that the open-air treatment should be begun at a very early stage. Dr. Cattle, in a recent article in *THE PRACTITIONER*, would select for sanatorium treatment cases where the disease is limited to one lobe of one lung without clinical signs of cavity, and other eminent authorities have expressed similar views. At a later stage, when cavities have already formed, open-air treatment does not as a rule appear to lead to cure or permanent arrest of the disease. There may be alleviation, and the patient may be able to resume his occupation for a time, but an eventual relapse appears to be the rule and not the exception.

Having regard to the very insidious nature of commencing phthisis, and to the fact that the working classes rarely seek medical advice in the very early stages of the disease, and if they do, are by no means sure of having their condition correctly diagnosed, the exigencies of club practice being what they are, it does seem somewhat improbable that the poorer class of patients will present themselves for sanatorium treatment at the period of the disease when the best results from open-air treatment could be obtained. Still there would probably be a considerable minority of cases—hospital an

dispensary out-patients, for instance—whose condition would be recognised sufficiently early to enable them to derive benefit from open-air treatment ; and it might also be anticipated that when sanatorium treatment is gratuitously provided, more attention will be paid to early diagnosis by those practising amongst the working-classes.

For persons of the working class in the later stages of consumption there is practically but little choice between the patient's own home and the workhouse infirmary. In Chelsea, during the past five years, 36 per cent. of the deaths from phthisis have occurred in the Chelsea workhouse infirmary, 11 per cent. in hospitals and other public institutions, and 53 per cent. of the deaths in the patients' own homes. These figures are probably not largely departed from, taking London as a whole ; and it is safe to assume that about half the deaths from phthisis occur in the patients' own homes. For the working-classes only, the proportional numbers or percentage dying in the workhouse infirmaries is probably considerably higher.

The retention at home of the phthisical patient in poor circumstances, until death effects a release, is very largely a question of public health, and will be referred to later on. The elimination of chronic consumptives from the wards of the workhouse infirmaries is generally considered desirable by poor-law infirmary medical officers. The generality of such wards are not in any way adapted to the treatment of tubercular cases, according to modern ideas ; the patients themselves derive the minimum of benefit from their sojourn in the wards ; they constitute a danger to others who are free from tubercular taint ; and they take up beds which could be utilised to better purpose by non-tubercular cases.

(2) From the point of view of social economy the provision of open-air sanatoria provides much matter for debate. This appears to be the aspect of the question that has received most consideration in Germany. If it be possible to select early cases amongst the working population, and if it is the fact that in a majority of such cases subjected to sanatorium treatment there is restoration to health and permanent arrest of the disease, then the system is likely to prove economical, as a relatively small expenditure on treatment at the outset

will save a relatively large expenditure in the case of those—and they are the majority—who, in the absence of such treatment, would find themselves unable to maintain themselves and their dependents, and so become a charge on the rates. There is probably not sufficient evidence as yet to hand from Germany to enable this question to be satisfactorily answered. A complete study of the subject has yet to be made; for it involves the investigation and recording of the health and industrial capacity of those discharged as cured from the sanatoria for several years after leaving these institutions, and a comparison of the economical results so obtained with those of the period prior to the establishment of sanatoria.

As regards the provision of hospitals or sanatoria for those who are in an advanced stage of consumption, in so much as this is merely a transference of consumptives from the workhouse infirmary wards to other buildings especially adapted for such cases, the question of expense apart from initial outlay on buildings is not one of very great magnitude. In either case the charge for the maintenance and treatment of such cases has to be borne by the rates. The sanatorium treatment of advanced consumptives, who are now treated in their own homes, is mainly advocated on the grounds of public health, and the economical aspect is identical with the public-health aspect. If it is true that the isolation of advanced consumptives tends to prevent the spread of the disease, then—it being generally admitted that all measures of disease-prevention are in the long run economical—this also will be a profitable outlay.

In connection with the suggestion that has been made that the Metropolitan Asylums Board should undertake the sanatorium treatment of London consumptives, it must be recollected that the Board is not at present being asked to acquire sites and to erect new sanatorium buildings for the purpose. The Board is the infectious-disease hospital authority for the metropolis, and at the present time has accommodation in its various fever hospitals for nearly 6,200 patients (cases of scarlet fever, diphtheria, and enteric fever), and in its small-pox hospitals for nearly 4,000 patients. Two of the small-pox hospitals—the Upper and Lower Gore Farm Hospitals, near Dartford, Kent—were designed to hold convalescent

patients, but they have never received a single case of this disease. The Upper Gore Farm Hospital, erected in 1890, has accommodation for 1,040 patients, and the Lower Hospital, reerected in 1902, for 850 patients. They are said to be well adapted to the purposes of sanatorium treatment of consumptives, although not, of course, ideal structures for such a purpose.

The hospitals are situated on undulating ground with a south aspect about two miles from Dartford. The soil is said to be dry, and the grounds are extensive, covering an area of 160 acres, which includes wooded country as well as farm land. There is shelter from the north by belts of trees. The upper hospital is of brick, comprising twenty blocks for patients, and the necessary administrative buildings. All the wards are cross-ventilated. The lower hospital consists of huts. The necessary shelters, verandahs, and covered courts required for open-air treatment could be provided at no great cost, and the grounds would lend themselves well to the purposes of recreation and exercise so necessary in the treatment of such cases.

Those who have made a study of the history of Metropolitan small-pox do not consider it probable that these convalescent hospitals will ever be required for the treatment of small-pox cases. Since 1885, when the old system of treatment of London small-pox cases in hospitals situated within the Metropolitan area was finally discarded, there has been but little small-pox in London. There was a small epidemic in 1893, and another very much larger one in 1901-1902. Even in the latter, however, the largest number of patients under treatment on any one day was only 1,604 (February, 1902), so that even if there was another epidemic of this magnitude in the years to come, there would probably still be on any one day some 400 beds for acute cases in reserve, before there would be any necessity to utilise the convalescent hospitals. There have been only two epidemic outbreaks of small-pox in London during the past twenty years. It is of course impossible to forecast the future, but there seems every probability, if the Gore Farm Hospitals are retained for their original purpose, that they will not receive a single patient for ten years to come, and possibly never will receive a patient. It seems a pity that the large outlay on these buildings, which are quite

remote from the Long Reach, Orchard, and Joyce Green Hospitals for acute small-pox, should be altogether thrown away, as must be the case if the views formerly prevailing as to the possible incidence of small-pox in the metropolis undergo no revision.

The 1,850 beds at the Gore Farm Hospitals would accommodate theoretically 7,400 patients per annum, on the assumption that the average period of treatment for each patient was three months. The average number of deaths yearly from phthisis in London during the past four years has been 7,683, and the average number of persons suffering from this disease in London at any one time is probably about three to four times the annual number of deaths—say, 27,000—so that the Gore Farm Hospitals would provide accommodation for more than a quarter of the total London consumptives, on the basis of a three months' treatment for each. This use of the hospitals would be apart from their utilisation as refuges for chronic infirmary cases, and as homes for the dying. The number of cases of phthisis in the Metropolitan Poor Law Infirmaries was some years ago (July 1900) stated to be 1,562 on a particular day. Of this number Dr. Downes, Medical Inspector of the Local Government Board, stated that 1,000, or two-thirds, could be moved to a sanatorium within 50 miles of London, and of these 1,000, 400 were in the initial stage of the disease. The Gore Farm Hospitals would, therefore, do but little more than provide accommodation for poor-law infirmary cases of phthisis; and if it is decided at any time to make sanatorium provision for such cases, it will probably be necessary, and be found desirable, to have the accommodation for chronic and advanced cases separate and distinct from that for cases in an early stage of the disease.

(3) It is not possible in this article to discuss the question of the infectivity of the bacillus of tubercle. That it is infective under certain conditions is now generally admitted, although it is not possible to say how much of the phthisis prevailing in our midst is due to neglect of isolation of consumptives, or to neglect of the necessary precautions by invalids in dealing with expectorated matters. If sanatoria were provided, it seems highly probable that the public health would benefit by the withdrawal from amongst the general population of some of

the active foci of the disease, and that a reduction in the prevalence of consumption would in consequence ensue.

From the public-health point of view the most important result of sanatorium treatment would be the educational effect upon the patient. There can be no question that even so short a stay as a month in an open-air sanatorium, as practised at Brighton, enables the patient to acquire to some extent those precautionary habits which are so useful in preventing the possible diffusion of the disease on his return home. Then again, the patient becomes impressed with the importance of, and the necessity for, fresh air. On leaving the sanatorium he becomes a valuable agent in spreading around him habits of cleanliness and a desire for fresh air, matters which are still but little appreciated by great sections of the working population. The uninstructed amongst his friends and associates are astonished to find that one whose lungs are "delicate" can with impunity sit or sleep with windows open day and night, and that there is a positive craving for fresh air. The permeation of the general population by converts for "open-air" treatment would undoubtedly exercise a great influence for good on the habits of the people, and would assist in counteracting that tendency to physical deterioration which is the result of overcrowding in large cities.

It would appear, then, that open-air sanatoria for the gratuitous treatment of the poorer classes of the community are justified (1) on the ground of relief to the sufferers, (2) of a possible eventual monetary saving to the rates by the cure of some who would otherwise become permanently incapacitated and a charge upon their parishes, and (3) upon public-health grounds, by removing possible infective foci from amongst the general population, and by educating both the sufferers and the general public in the prophylactic and hygienic requirements of domestic life.

If it was merely a question of treatment of disease, the whole matter might safely be left in the hands of the general body of the medical profession engaged in curative practice. But as the public-health aspects of the question cannot be ignored, in order to derive the greatest benefit from the provision of free sanatoria, the medical officer of health should receive notification of all cases of pulmonary phthisis which in

the opinion of the medical attendant are considered suitable for sanatorium treatment, or are regarded as dangerous to other inmates of the house owing to defective hygienic surroundings. As to the latter class, the medical officer of health should be the judge as to the need of removal. Compulsory removal, where the patient or his friends are unwilling, is not, however, regarded as desirable, and persuasion only should be exercised. The notification of cases to the medical officer of health also ensures that the rooms vacated by a consumptive and his clothing are subjected to efficient disinfection and cleansing, and that, in the event of removal to the sanatorium being considered unnecessary or being declined by the patient, proper precautionary methods are observed by the patient.

Having regard to all the circumstances, there are many grounds for anticipating an opinion from the Local Government Board favourable to the establishment of rate-supported open-air sanatoria for London consumptives.



Reviews of Books.

Diseases of the Pancreas and their Surgical Treatment. By A. W. MAYO ROBSON, F.R.C.S., Consulting Surgeon to the Leeds General Infirmary, &c.; and B. G. A. MOYNIHAN, M.S., F.R.C.S., Assistant Surgeon to the Leeds General Infirmary, &c. Philadelphia and London: W. B. Saunders & Co.

THE authors of this book have set before themselves a two-fold object, viz., to record and review the work done in the past, and to indicate, as far as possible, the scope and trend of future research. The former object has been very successfully accomplished, a full reference being made throughout the text to most of the literature bearing on the matters discussed. In these days of limited opportunity but superabundant literature, it would have been perhaps as well to append merely a list of authors and their works at the end of each chapter, gleaned the gist of them in the text. After eliminating the full records of previous work, the remainder of the book occupies a small compass; but such as it is, it demands attention as being the outcome of much study and practical experience. The anatomy of the pancreas is first described. The account given of the arterial and venous supply is good and differs much from that found in text-books; while the description of the mode of termination of the pancreatic ducts in the duodenum is useful from the practical point of view. Chapter II. deals with experimental work and the relation between Diabetes mellitus and disease of the pancreas. This is a well-written and important chapter, based mainly on Opie's work, which tends to prove that affections of the Islands of Langerhans are the lesions causally associated with diabetes. Injuries of the pancreas are dealt with in Chapter III. The occurrence of severe injury confined to the gland is rare, such injury being usually associated with damage to the surrounding organs, and consequently almost invariably fatal. Less severe injuries lead to haemorrhage and escape of pancreatic secretion, either retroperitoneally or into the lesser sac: these are amenable to

treatment by incision and drainage. Still less severe trauma leads to the production of pancreatic cysts or pseudo-cysts. The lines of treatment in the various cases are laid down. Three chapters are devoted to the varieties of acute pancreatitis, which appears to be caused by bacterial infection, conveyed either along the duct of Wirsung or by the blood-stream : it may also be due to entrance of bile into the duct, when the opening into the duodenum is blocked. The authors discuss very sensibly the relation of haemorrhage and the haemorrhagic diathesis to pancreatic disease, and give some useful information on the difficult subject of diagnosis. The concluding chapters deal with Chronic Pancreatitis, Cysts, and diseases such as Tumours, Syphilis and Tuberculosis. The volume as a whole contains a very useful and important collection of facts. The chapters on those subjects of which the authors have had most practical experience especially commend themselves, and the book deserves study by all practitioners both of medicine and of surgery.

A Manual of Medicine. By THOMAS KIRKPATRICK MUNRO, M.A., M.D. London : Baillière, Tindall & Cox. Pp. 901. Price 15s. net.

THIS is the latest addition to the University Series of Manuals, already made popular by the appearance in it of Rose and Carless' "Manual of Surgery," and Stewart's "Manual of Physiology." The book aims at being one which will cover more than the small treatises available to the student, but also one which will remain within the scope of a one-volume handbook. We think this object has been attained. As an introduction to medicine the volume can be thoroughly recommended. It is lucid, well arranged, printed in large type throughout, and omits no facts of fundamental importance. We feel it necessary, however, to warn students that it is an introduction only ; to junior practitioners we fail to see how it can be of that service which the author hopes for in his preface. For many purposes of reference by the practitioner it is much too elementary. The book appears to have been carefully prepared as regards the text. But we notice, in the paragraph dealing with the symptoms of cancer of the oesophagus, the

following : "The most important early symptom is increasing dysphagia, first, as regards liquids, and later with regard to solids also." The reverse is, of course, true.

Wheeler's Handbook of Medicine and Therapeutics. Second Edition, revised and enlarged by WILLIAM R. JACK, B.Sc., M.D., Assistant to the Professor of the Practice of Medicine, Glasgow University. Edinburgh : E. and S. Livingstone. Pp. 432. Price 8s. nett.

THIS little book may be commended to students of medicine who are beginning their ward-work, or who desire to look up the subject quickly before an examination. The former class will find it to contain a clear account of the elements of the art which they wish to learn, and the latter will specially appreciate the tables in which leading symptoms, &c., are grouped and classified. We cannot expect to find in a volume of this size a complete system of medicine, so that we do not advise students to depend entirely upon this handbook ; but for the purposes which we have indicated it was well worth writing, and is equally worth reading. For its size it contains an astonishingly-large amount of information, which is in the main reliable and up to date.

Paul Gutmann's Lehrbuch der klinischen Untersuchungsmethoden für die Brust- und Unterleibs-Organe. (Text-book of Methods of Clinical Examination of the Chest and Abdomen.) Herausgegeben von Dr. FELIX KLEMPERER, Privatdocent an der Universität in Berlin. Berlin : Aug. Hirschwald.

THE volume before us constitutes the ninth edition of Gutmann's original work, which fact should be sufficient proof that the book has met with appreciation in the past. It deals very thoroughly with our present methods of clinical examination of the chest and abdomen, including not only physical investigation by such means as palpation, auscultation, &c., but also the study of the urine, faeces, blood and sputum. The only defect in respect to its contents is the omission of all reference to skiagraphy in medical diagnosis. Although this method has not thus far afforded so great and assured

an aid to the physician as it was at one time legitimate to hope, yet in the investigation of aneurysms in the thorax, as well as in the search for calculi in the kidney, it has proved itself to possess definite value, and it may give even greater assistance in the future. With the exception of this omission, which cannot be considered serious, we have nothing but praise for Dr. Klemperer's book. It is very thorough, is pleasantly written, and bears the stamp of a practical teacher. To the publisher we would venture to suggest that, in the absence of illustrations, there is no need to employ so smooth-surfaced a paper, which makes the book rather trying to read by candle-light.

A Text-Book of the Practice of Medicine. By JAMES M. ANDERS, M.D., Ph.D., LL.D., Professor of Medicine and Clinical Medicine at the Medico-Chirurgical College, Philadelphia, &c., &c. Illustrated. Sixth Edition, thoroughly revised. Philadelphia, New York, and London : W. B. Saunders & Co. Price 24s. nett.

THE sixth edition of Prof. Anders' text-book does not need extended notice. It is much better written than are many American medical works, and forms a useful and complete manual of the subject of medical practice. It appears to be thoroughly up to date, and deserves the appreciation which it has evidently met with on the other side of the Atlantic, bearing, as it does, marks of the hand of a practical physician in much of the advice which it contains. The illustrations are good and not unnecessarily numerous. Some of them are printed in colours, and the fact is actually not recorded on the title-page.

A Text-Book of Pathology. By ALFRED STENGEL, M.D., Professor of Clinical Medicine in the University of Pennsylvania, &c. Fourth Edition, thoroughly revised. Philadelphia, New York and London : W. B. Saunders & Co. Price 21s. nett.

THIS volume of some 900 pages is divided into a general part of about 300 pages, and a special part filling the rest of the book. From this it will be seen that the general side of

pathology is somewhat scantly treated, while the diseases of the different organs and systems are considered at considerable length. This was perhaps to be expected from an author who is a Professor of Clinical Medicine. There is a good account of the animal parasites which cause disease, a subject which is sometimes rather neglected in text-books of pathology. The book may be commended to those who are acquainted with the principles of pathology and are in need of information on morbid conditions of special regions or special diseases. The illustrations are generally good.

Medical Microscopy. By T. E. OERTEL, M.D. With 131 Illustrations, some Coloured. Pp. 362. Rebman, Limited.

THIS is a comparatively small work, and does not compete with the more exhaustive books by C. E. Simon or von Jaksch, or even with Hutchison and Rainey's widely-used handbook. The writer indeed in no way attempts this task, and has specially arranged his volume for the beginner in microscopy, and for the busy practitioner of some standing who conducts his own post-graduate course. For this purpose it may safely be recommended.

A Text-Book of Legal Medicine and Toxicology. Edited by FREDERICK PETERSON, M.D., President of the New York State Commission in Lunacy, &c., and WALTER S. HAINES, M.D., Professor of Chemistry, Pharmacy and Toxicology in Rush Medical College, &c. In 2 Vols. Vol. I., pp. 730. With numerous Illustrations and many Coloured Plates. Philadelphia and London : W. B. Saunders & Co.

THE first volume of this collaborative work on forensic medicine and toxicology contains an immense amount of information on nearly all branches of the former subject. Beginning with the behaviour of the expert witness in court, we find succeeding chapters dealing with the performance of autopsies, the signs of death as caused by various means—burns, gunshot wounds, strangulation, &c.—the effects of railway accidents, life-insurance, ineptitude, &c. There are also

sections dealing with the medico-legal side of insanity. The book is profusely illustrated, and forms an attractive volume; some of the coloured plates are specially commendable. There is only one serious drawback to its value from the point of view of the English reader, and this is, the fact that the legal information represents American, and not English law. In spite of the close resemblance of the two legal systems, they are not identical, and the reader who should take his forensic law from the cases quoted in this volume, would be liable to find himself misled in particular instances. If Messrs. Saunders would bring out an English edition of this excellent work, in which the legal part of the contents was revised in accordance with the law of this country, we think that they would have supplied a definite want. At present the defect alluded to makes it improbable that the book will command any large sale in this country.

Surgical Bandaging and Dressings. By W. JOHNSON SMITH, F.R.C.S. London : The Scientific Press, Limited. Price 2s.

IN writing this little work, the author's intention has been to provide a ready and complete pocket reference-book for junior students and nurses in surgical wards. He has achieved both these objects. The size of the book renders it easily portable, and we can safely commend it to nurses engaged in both hospital and private nursing of surgical cases. Very useful chapters are included on the preparation of the operating-theatre and the method of preparing patients for operations in private homes. The chapter on "bandaging" is well written, and very clearly and profusely illustrated. That on "splints," also, is well worthy of perusal by anyone who wishes to be initiated into the uses and modes of application of some of the commonly used varieties.

Uric Acid as a Factor in the Causation of Disease. By ALEXANDER HAIG, M.A., M.D. Oxon., F.R.C.P., Physician to the Metropolitan Hospital, &c. 6th Edition. London : J. & A. Churchill. Price 15s.

THE rapid appearance of six editions of Dr. Haig's book on uric acid bear testimony to the interest which the subject

arouses in the reading public. We can admire the care and thought which the writer has devoted to the study of this poison, and the ingenuity of his experiments and of the theories founded upon them, without necessarily agreeing with all the conclusions derived from them. We need not recapitulate Dr. Haig's well-known views as to the diseases which may be caused by uric acid, as our readers had the opportunity of reading in our July number (1903) a *résumé* of them written by Dr. Haig himself. We can quite believe that the vegetarian régime laid down will be found beneficial by a certain proportion of patients, since there can be little doubt that at the present day there is a tendency to eat too much meat and other good things. Still we are not prepared to forego animal food or tea entirely, in fear that the future may "of these pleasant vices make whips to scourge us." The book is well got up and pleasant to read.

Plant Disease and its relation to Animal Life. By
E. F. WRIGHT. London: Swan, Sonnenschein & Co.
Price 3s. 6d.

WE merely notice this book to warn our readers that it is not what we hoped it would turn out to be when we read the title on the cover "Plant Disease"—viz. a scientific treatise on diseases of plants. It is a curious attempt to prove that all diseases depend on eating "anaemic" plants, *i.e.*, plants deficient in chlorophyl. The argument, if so it may be called, is supported chiefly by quotations from the much-advertised "*Encyclopædia Britannica*," with others from divers sources such as *M.A.P.*, *The New York Herald*, and various text-books of physiology and agriculture. As an example of the reasoning we may quote the following:—"This being so (that bacteria possess no chlorophyl) it is an obvious deduction that the plant (or animal) on which they thrive is also so deficient, and this seems to settle the question whether the parasite produces the disease or is a symptom of it." We may also quote the following comfortable opinion, which may be commended to the authorities of the Cancer Research Fund: ". . . if those suffering from cancer could only be fed on food like apples, milk, cream, spinach, cinnamon tea if you

like, and other foods all produced on scientific lines, so that the food should contain the maximum of ash constituents, and consequently the maximum of normal proteids, then I think there would be no difficulty in curing cancer."

Progressive Medicine. Vols. I. and II. Edited by H. AMORY HARE, M.D. Rebman, Limited. Price 15s. each, or 52s. 6d. for the whole 4 Volumes.

THESE well got-up volumes contain a series of articles dealing with the work of the previous year, and put the reader in possession of the advances of medical science with the least possible trouble to himself. The first volume deals with the surgery of the head and neck, with infectious diseases, diseases of children, pathology, laryngology, otology and rhinology. The second comprises abdominal surgery, gynaecology, ophthalmology, and diseases of the ductless glands, blood, &c. The amount of work involved in the preparation of so complete a work must be enormous, and the editor and his collaborators are to be congratulated upon the production of a book which will be a valuable addition to the library of any medical man who is interested in studying the most recent researches in both medicine and surgery.

Diseases and Injuries of the Eye, with their Medical and Surgical Treatment. By GEORGE LAWSON, F.R.C.S. Eng., Surgeon Oculist-in-Ordinary to Her Majesty the late Queen Victoria, Consulting Surgeon to the Royal London Ophthalmic Hospital and to the Middlesex Hospital, &c. Sixth Edition. Revised, and in great measure Re-written, by ARNOLD LAWSON, F.R.C.S. Eng., Assistant Surgeon to the Royal London Ophthalmic Hospital, Ophthalmic Surgeon to the Paddington Green Children's Hospital, &c. London : Smith, Elder & Co.

NEATLY bound in green cloth, beautifully printed on good paper, and abundantly illustrated with original woodcuts, the appearance of this book leaves little to be desired. Eighteen years have elapsed since the fifth edition of Mr. George Lawson's very popular little text-book appeared. If the

increased bulk of this the sixth edition, re-written by his son, represents the growth of the subject since that time, then indeed we have been progressing rapidly. If, moreover, this rate of increase is continued, alas! for the student of future generations. The great merit of the older book was that it reflected the charming personality of its author. It did not aim at telling everything of the subject, but breathed throughout of the writer's own practical experience and treatment. It was no easy matter for a fresh hand to take such a book and bring it up to modern requirements. After a perusal of this new edition, we feel sure that no one could have accomplished the task in so satisfactory and sympathetic a manner as Mr. Arnold Lawson has succeeded in doing. Whilst considerably altering the character of the book by dealing at much greater length with the anatomical, pathological, and theoretical aspects of the subject, he has retained and enriched the clinical experience which was the characteristic feature of the previous edition. In reading the book we feel throughout that the authors are giving us directions for the treatment of patients, and not merely telling us the best application or operation for any particular affection.

A few details are open to criticism. When the early editions of the work came out it was no doubt correct to say, in speaking of gonorrhœal conjunctivitis, that "a few years ago the treatment consisted in excessive bleedings from the arm and in the use of strong depressing medicines." It is now a long time since such a practice was abandoned, and it is very improbable that Mr. Lawson, junr., has ever seen it employed. It is to be regretted that in a work designed for students and practitioners no mention should have been made of that important subject, the preventive treatment of ophthalmia neonatorum. No directions whatever are given as to the care of the eyes of infants at birth, and nothing is said of the brilliant results obtained in lying-in institutions by Credé and others from the systematic use of nitrate of silver. We are sorry to see that in speaking of the clinical types of Primary Glaucoma, the terms inflammatory and non-inflammatory are employed, instead of congestive and non-congestive, as these latter offer such a much more accurate idea of the pathology of the affection. In depicting the microscopical appearances

of interstitial keratitis it would have been better if a more typical specimen had been selected than that shown in Fig. 81. The cell-infiltration and new blood-vessels are usually found in the posterior or deep layers of the substantia propria, whereas in Fig. 81 they are confined to the anterior layers.

We have picked out for comment these few defects; to enumerate all the good points in the book would require a lengthy article. Suffice it to say, that it offers as complete and accurate an account of eye-disease as any modern text-book by a British author. We must not conclude without mentioning the index, which is most elaborate, and renders reference to any subject exceedingly easy. It occupies 47 pages, and contains numerous cross-references.

Atlas and Epitome of Human Histology and Microscopic Anatomy. By Dr. JOHANNES SOBOTTA. Edited with extensive additions by G. CARL HUBER, M.D. Authorised translation from the German. Pp. 248 with 171 illustrations on 80 lithographic plates and 68 text-illustrations. Philadelphia and London : W. B. Saunders & Co. Price 18s. nett.

THIS atlas contains an excellent series of illustrations of the minute structure of human tissues. There is no doubt that the illustrations portray most faithfully the microscopic preparations. This is due, as the editor states in his preface, to the fact that the original drawings were made after the following method, which was suggested by Sobotta :—"The preparations were photographed under the same magnification as that under which they were drawn. The photographs were then used as a basis for the drawings, in that outline drawings, even to the finest details, were traced on tracing-paper; these outline drawings were then transferred to drawing-paper." Drawings made with such care are better than micro-photographs. The value of this book lies in the excellence of the illustrations, the great majority of which were made from sections prepared from the tissues of criminals who had been executed. The text is concise and clear. We most heartily recommend the book, especially to the student of medicine, for it is an excellent atlas of human histology.

Suggested Standards of Purity for Foods and Drugs. By
C. G. MOOR, M.A., F.I.C., F.C.S. Pp. viii and 260.
London : Baillière, Tindall, and Cox. Price 7s. 6d.

THE analysis of foods and drugs has given rise to a literature so large and varied that any attempt to bring together the data either of results or methods ought to be cordially welcomed. Mr. Moor's compilation of numerical results and the names of the workers who have obtained them will be of great assistance to those analysts whose experience in the examination of drugs is somewhat limited, inasmuch as they will have indication of the average value of the chief analytical factors obtained by reliable chemists. For our own part we must confess to a feeling of disappointment that the author has written his book without having clearly before him the mark at which he was aiming. By standards of purity we understand the setting of limits of purity within which foods and drugs most fall, in order to be considered pure enough for general use in dietetics and in medicine. It was to be expected from the title of the book that Mr. Moor would have given, say in the case of *tinctura calumbæ*, the extreme limits of specific gravity within which it would fall when made according to the *Pharmacopœia* from average specimens of calumba-root, and similar limits for the alcoholic content and the total solids. Instead of doing this, he presents us with promiscuous lists of the figures obtained by different workers from samples, the mode of manufacture of which in some cases is even unknown. He has not taken the trouble to set forth the data in series, so that we can learn the specific gravity, alcohol-content, and total solids of a single specimen, which, naturally, are so closely correlated that we are sure no analyst would judge of a tincture, unless it were grossly adulterated, without considering the relation they bear to one another. The author's experience has been so extensive that it is to be regretted that he has left his readers without the benefit of his guidance. To take another instance from calumba :—The ash of the root, according to the authorities quoted, varies from 4·3 per cent. to 9·6 per cent. in the whole root. Some suggestion ought to be given as to the legitimate amount present in the official drug. The instances we have given are types of the remainder, unless it happens to be a case similar to colchicum wine—when we find the

"suggested standard" is "Prepared by macerating 200 grammes of colchicum corms (in No. 20 powder) in 1,000 c.c. of sherry." Before a second edition is published we think Mr. Moor would do well to rearrange the matter entirely to suit his title, and then we have no doubt it will be a most suggestive help to the users and compilers of the National Pharmacopœia. We fear we have already dwelt too lengthily upon the shortcomings of this work, but we cannot but refer to the paucity of information given concerning foods. In fact, out of a total of over three hundred articles dealt with, less than forty are foods.

Comparative Odontology. By A. S. UNDERWOOD, M.R.C.S., L.D.S., Professor of Dental Surgery in King's College, &c. Cr. 8vo. Pp. viii + 152, with 77 illustrations. London : Baillière, Tindall, and Cox. Price 5s. nett.

"THE immediate object of this book is to render the study of Comparative Odontology easier, and, I am tempted to hope, more attractive." So says the author in his preface. In this object we think Professor Underwood has succeeded. Comparative Odontology is throughout dwelt on in its most interesting aspects. In connection with the evolution of animal forms it becomes absolutely fascinating to find that through the study of Comparative Odontology one molar tooth will literally make these dry bones live! The style throughout is well calculated to hold the reader, but is always made subordinate to scientific accuracy. Illustrations are sufficiently numerous ; but, despite the author's explanatory note in his preface, we cannot but think that many are too diagrammatic and flat. The index also is too scanty. Yet these are minor blemishes. All told, Professor Underwood's book provides us with a very attractive introduction to Comparative Odontology.

Muco-membranous Entero-Colitis. By MAURICE DE LANGEN-HAGEN, M.D. Pp. 115. London : J. & A. Churchill. Price 3s. 6d.

THIS compact little book dealing with the symptoms, complications, aetiology, and treatment of mucous colitis is by a

consulting physician at Plombières, to which patients with this disease and with the manifestations of the arthritic diathesis freely resort. Like many other diseases it is commoner than is generally believed, and is more frequently recognised now than in past times. Most of the literature is French, but justice is hardly done in the author's list of references to the writings of English-speaking medical men. This study is based on twelve hundred cases, and is both well and moderately written ; no exclusive claims are made for its treatment at Plombières, in favour of which the writer might naturally be thought to be prejudiced. The disease is regarded as evidence of the "neuro-arthritic" diathesis. The interesting condition of intestinal lithiasis or sand occurred in 112 of the 1,200 cases of mucous colitis (9 per cent.), and is considered as a complication of the intestinal condition and not as an independent arthritic manifestation. Appendicitis, which has been thought to have definite relations to mucous colitis by some French authors, is not more frequent in this disease than in any other class of patients.

Manual of Intra-Gastric Technique. By GEORGE HERSCHELL,
M.D. London : H. J. Glaisher.

THIS little manual deals, in a most satisfactory manner, with the forms and uses of apparatus employed as aids to the diagnosis and treatment of the various affections of the stomach. It is essentially practical, and is, as far as we know, unique. A considerable part of the work is, with very little practice, well within the reach of every medical man, and we should particularly recommend to all practitioners the chapters on : The stomach-tube and its uses ; Inflation of the stomach ; Extraction and examination of gastric contents, and lavage of the stomach. The indications for use, the clinical interpretations of results, and the effects of treatment are not dealt with, or, at most, are only mentioned occasionally as illustrations. Indeed in some of these we are not entirely in accordance with the author. For instance, we should very much doubt the propriety of passing a tube into the stomach for purposes of treatment in cases of erosions and ulcers of the viscus ; and we

cannot admit the close relation asserted between the presence of lactic acid and gastric carcinoma. Thus the author tells us that if a Boas's test-breakfast be given with the precautions which he describes, and the meal be extracted one hour later, "lactic acid will probably only be found to be present in cases of malignant disease." We are told that the passage of the stomach-tube is, with a little practice, a most easy accomplishment, and if one can pass this skilfully, every other form of gastric tube can be most successfully manipulated. That this is so in the majority of cases we have no doubt, but we cannot go so far as the author and say that we have yet to find a patient who would not allow a tube to be passed, if necessary. It would even appear that difficulties have occasionally arisen in the author's own practice, for in the discussion on the best method of inflation of the stomach, he, while giving very good reasons for preferring this to the "tube-method," admits that, when the patient will not allow it to be done, he employs the carbonic-acid method as a substitute. In order to overcome the disadvantages inherent in the "carbonic-acid method" of inflation, the author gives formulæ, graduating the amount of material used to the apparent size of the stomach, as made out by palpation and percussion. We hardly appreciate the necessity of this. The apparent size of the stomach, together with the symptoms, would seem sufficient for treatment, without putting the patient to the somewhat uncomfortable procedure of gastric inflation. The various methods of intra-gastric treatment and the application of electricity to the stomach can only be done by one well-experienced in these matters, and before commanding it too highly we should prefer to know the results obtained thereby. It is not the author's intention, however, to describe indications or results. He desires simply to instruct the student in the use of apparatus, and thus to fill a blank in the ordinary books on gastric disorders. This he has done. Every student interested in this branch of medicine must have felt the want of some such manual as this, and should be perfectly satisfied with the one now presented to him. The description of all the forms of apparatus and their uses is very clearly put, and the instructions are easy to follow. The book is well illustrated.

Moore's Family Medicine and Hygiene for India. Seventh edition by Major J. H. TULL WALSH, I.M.S., F.L.S. Crown 8vo, pp. 680. Illustrated. London : J. and A. Churchill. Price 12s.

THE original author of this well-known publication was awarded a prize by the Indian Government in 1873 for the production of a volume which should be of use to the numerous individuals, families, and official establishments scattered throughout India, on occasions when medical aid was not obtainable at all, or not available till after some considerable time from the onset of illness. No one who has known the immense boon of a reliable medical guide, when resident in a remote colonial settlement, can offer one word of criticism of the good intentions of the Indian Government in encouraging the production of this useful volume, but we do not hesitate to say that we think that both the Indian Government's purpose, and Sir William Moore's original successful efforts in carrying it out, have in this the seventh edition been exceeded to a most unnecessary extent. Much matter has been introduced which can be of no service whatever to the lay mind. If modern medical teaching tells us to eschew the use of such terms as "croupous laryngitis," why should the lay mind be distracted by distinctions between this and diphtheria? What is the purpose in stating that diarrhoea may be due to an overflow of bile, that sprue is due to changes of temperature preventing the formation of bile, that epileptic fits may be caused by the drying-up of eczematous discharges, that arcus senilis is an association of fatty degeneration of the heart in old people, that under medical advice cacodylate of soda may be useful in myxoedema, that inflammation of the kidneys may be caused by long-continued and violent exercise of the muscles of the back as in riding? Then, why should the reader be treated to the old-world distinctions between the dark and fair types of scrofula? And why should scurvy be made to include such a large group of disorders? We suspect that under the headings of scurvy and scrofula, such varied disorders as pyorrhœa alveolaris, enlarged tonsils and adenoids, &c., have been included, as well as Beri-Beri, acknowledged by the writer. Nor is it in conformity with professional etiquette that proprietary articles should be advocated in the treatment of

rheumatic and gouty iritis. We have quoted these statements in hostile criticism because we wish to be fair both to the medical profession and to those in need of medical assistance, and to protect them from an unwise liberality on the part of the writers of treatises on family medicine. It must not, however, be thought that the volume has no virtues : some of the subjects are treated admirably, and we call attention especially to the useful accounts of diarrhoea in children, typhoid fever, malaria, gravel, headaches, piles and cutting of teeth, infant-feeding, the management of pregnancy, labour, and the sick-room, and on the preservation of health in India. If the present editor in a future edition would expunge much unnecessary anatomical, physiological and pathological information, and keep before him the original purpose of the Indian Government, there is every reason to believe that the volume would continue to be useful to the lay mind. It is unfortunate that Major Tull Walsh should have adopted entirely different plans in this edition from those laid down by the original author with respect to the use to be made of the small-typed paragraphs, as indicated by the statement made in the author's preface to the sixth and seventh editions.

Journal of the Royal Army Medical Corps.—We are glad to see that this recently-founded journal continues to flourish. The numbers are brought out in a most attractive form, and are well printed and illustrated, while the contents afford most interesting reading. Indeed, this could hardly be otherwise, if the members of the R.A.M.C. support the journal by recording their experiences ; for the amount of material available must be very large, and the members of the medical service are well qualified to make the best use of their opportunities. Scattered as our military colleagues are over the four quarters of the globe, they should be able to make their Service journal one of the most important agencies for recording the results of medical research and for the interchange of ideas and criticism. Under the able editorship of Colonel David Bruce, F.R.S., this ideal is rapidly being realised, and we wish—and prophesy—a long and distinguished career for this excellent journal.

Notes by the Way.

An Ambulance Service for London.

THE prominence which has been given at the recent elections to the London County Council to the question of providing an efficient ambulance service for London cannot fail to prove useful. We must congratulate Mr. Reginald Harrison and the energetic secretary of the movement, Dr. Arthur James, on their endeavours to impress this crying need of the metropolis on the various candidates, and it is to be hoped that the latter will not allow the sympathy which they in many cases expressed for the project to evaporate in the sunshine of actual office. The deficiencies at present existing are only too manifest to anyone who has had experience of casualty work at any hospital. The actual number of ambulances of all kinds is quite inadequate, and few persons can know in an emergency where to go for such as do exist. The question of providing more, and of instituting some method of summoning assistance at need without undue loss of time, is indeed a pressing one. It may not perhaps lend itself to partisan treatment or afford ground for heroic struggles of opposing senators, but it is not always the showiest measures which are productive of the greatest good. And even in municipal politics good measures are sometimes remembered, and may even pay.

* * * * *

Sanatoria for the Tuberculous Poor.

THE suggestion which has been brought before the Metropolitan Asylums Board and strongly urged by Dr. Orme Dudfield, and which is discussed by Dr. Louis Parkes in his article on another page, for the conversion of some of the accommodation provided by the Board for the reception of smallpox patients into sanatoria for the consumptive, merits very serious consideration. We cannot hope that the antivaccinist will cease from troubling yet awhile, or that we shall escape the due reward of tolerating conscientious objectors, in the form of occasional epidemics of variola; but even in the recent epidemic it was

found that more than enough space was provided for the needs of all the patients who had to be treated, and we need not expect more severe visitations, seeing that the statistics of successful vaccinations have on the whole improved. Hence we may safely assume that we should be running no risk in converting some of the beds provided for smallpox convalescents to some other purpose. What more pressing need is there than that for sanatoria for the consumptive poor? At present there is practically no sanatorium accommodation for the poor: the cost of treatment is almost prohibitive for those of limited means, and for those without means at all the chances of such treatment are almost *nil*. Yet the disease continues to flourish, and yearly claims its thousands of victims in London. Now that the benefits to be derived from open-air treatment are well known, every effort ought to be made to bring this chance of respite within the reach of all sufferers. A beginning must be made somewhere, and if there are vacant hospitals lying idle, which are suitable for this treatment, it would seem a simple measure to make trial at all events of some such plan as that alluded to by Dr. Parkes, and convert them into sanatoria for phthisical patients.

In this connection we may recall a former suggestion made by Dr. Parkes, with the same object, in our April number for last year. It was there pointed out that at present scarlet fever is a mild disease which scarcely deserves such careful isolation as is now enforced, since it is no more to be dreaded than, for example, measles, which we do not isolate in fever hospitals. And not only is this so, but we keep patients who have had scarlet fever in hospital for a long period of time, on the idea that the later stages of the malady are seriously infectious. This does not seem to be the case, the most infectious period of the disease being the early part. By turning these patients out more quickly or by ceasing to insist on their isolation we could provide many more beds for the treatment of phthisis, which is a much more fatal malady.

Whatever view may be taken as to these suggestions, it is a matter of urgency to provide means for the treatment of our consumptive poor in the manner which our present knowledge of the disease shows to be the most efficacious. We are a long way behind Germany in this matter, and must endeavour to

make up the ground that we have lost. The loss to the State through its weak and sickly members is enormous, and money spent on the cure of consumption will be money well laid out, even from the lowest point of view, that of £ s. d.

* * * *

The Infectivity of Phthisis. THE fact that consumption is an infectious disease is now becoming generally recognised even by the man in the street, though

that individual does not seem to be doing much in the way of mending his ways in the direction of ceasing to spread the infection. At least we do not notice any appreciable diminution in the habit of promiscuous expectoration. Yet this is not the only means of spread. In the later stages of the disease the affected person probably discharges into the air, with the spray of the cough which so incessantly troubles him, innumerable bacilli, which may not only infect his immediate surroundings, but be carried to distant parts. On these points education of the public is necessary. With this object we can commend to those who are interested in this process of education a little book written by Dr. Alfred Hillier,¹ giving a clear account of what is at present known of the facts involved in the diffusion of tuberculosis. It is simple in style and suited for the unprofessional reader, though there is much in it which may be usefully studied by anyone. It is based on the most recent teaching of Professor Koch, who has written a preface to it bearing witness that it is founded on his work.

* * * *

Notification of Tuberculosis. NOT much progress has been made at present in the direction of any systematic notification of cases of tuberculosis, though we believe

that Medical Officers of Health are almost unanimously in favour of such a means of combating the disease. We need not disguise the fact that the infectivity of tuberculosis is not like that of scarlet fever or measles ; yet we may agree that it would be useful from the point of view of the community in general that its appointed officers should be enabled to gauge

¹ *The Prevention of Consumption.* By Alfred Hillier, M.D., C.M., B.A., Secretary to the National Association for the Prevention of Consumption (London), &c. Revised by Professor Koch. Longmans, Green, and Co., London, New York, and Bombay. Price 5s. nett.

the amount of the disease which is prevalent in their districts as the first step in the direction of prevention. It is most desirable that those who have the care of persons suffering from pulmonary tuberculosis should realise the dangers which they run, and the means by which these dangers may be avoided. There is no need to exaggerate the risks of infection, so as to make friends and relations of the patients regard them as social lepers. Home care should still, in the majority of cases, be allowed and indeed encouraged, since there would scarcely be any hope of treating all the tuberculous in public institutions, owing to the number of those who are affected with the malady. But not only should those who are tending the patients be warned as to risks of the spread of the disease, but they should be instructed in the proper measures to be taken for the care of the sick. The need for fresh air is not yet, we fear, fully realised ; the old bogey of catching cold still frightens too many among us. It is for this reason that such a plan as has been instituted by Dr. Newsholme at Brighton, by which patients are sent for short periods of time into a well-managed sanatorium, not so much for the treatment of the disease as to instruct them in the real routine to be aimed at, seems to have so much to recommend it. A short sojourn in an institution will show the sufferer from tuberculosis what is meant by fresh air, and prove to him that it is possible to indulge in this unwonted luxury without any awe-inspiring consequences. Immense good may thus be done to individual patients, and more important still, education in sanitary matters may be spread abroad among all who come into contact with the one who has thus been taught in the first place. A comparatively small number of beds may, on such a plan as this, be sufficient for the training of a large number of consumptives, and for the diffusion of useful knowledge among a wide circle of friends and relatives.

* * * * *

THE Fourth International Home Relief Congress

Home Relief. The Congress is to meet in June next at Edinburgh. We must confess that the previous meetings of this Congress had escaped our notice, but the multitude of congresses at the present day is such that individual meetings tend to be overlooked if their merits are not equalled by the blatancy of

their advertisements. The Home Relief (*Assistance Familiale*) Congress has already met in former years at Paris, Antwerp, and Bordeaux. It deals with the supply to the poor in their own homes, not only of material and medical aid (food, clothing, drugs, nursing, &c.), but with the dissemination of useful sanitary and other information. We are glad to see that attention is paid to the rearing of children, not only by care after they are born, but by attention to the health of the mothers beforehand. One section of the forthcoming Congress (presided over by Mr. Malcolm Morris) is to deal, among other things, with the home treatment of tuberculosis. Other subjects of medical interest at the different sections will be the feeding of infants and school children, the care of habitual inebriates, the relation between hospital and home relief of the sick poor, the best scheme of attendance on puerperal women in large centres, and the care of the insane and of epileptic. We hope that the Congress will attain the success which the nature of its studies deserves.

* * * * *

**Progressive
Muscular Atrophy
and Allied
Diseases.**

THE clinical lecture by Dr. F. W. Mott, F.R.S., which we publish on another page, places the relations of progressive muscular atrophy to some allied diseases in a light which is not to be found in the majority of

text-books of medicine. As a rule, we find that not only are progressive muscular atrophy, amyotrophic lateral sclerosis, and chronic bulbar paralysis classified as separate diseases, but that the condition known as primary lateral sclerosis or primary spastic paraplegia is looked on as an entirely unrelated malady. Dr. Mott prefers to place all these conditions in one group ; they are instances of one and the same degeneration of the motor path affecting different parts of the system, the pathological condition being in reality the same. Either the upper or the lower segment of the motor tract may be affected first or alone, or the lesion may affect two separate parts at the same time. Diseases of the nervous system always constitute a difficulty to students, partly owing to the number of different diseases described, partly to the obscurity in which the physiology of nervous action is involved and to the intricacy

of the anatomy of the cerebro-spinal axis. Dr. Mott's illuminating conception certainly tends to make clearer one part of the field. The essential unity of locomotor ataxy and general paralysis of the insane, on which he has elsewhere insisted, is another instance of simplification in our ideas of nervous diseases. In the two latter conditions the importance of syphilis as a causal factor seems well established. In other nervous diseases little is known as to the ætiological factors at work, and in many, as in those first mentioned in this note, we must at present assume a primary lack of vitality in the neurons concerned—a true developmental defect rendering them susceptible to slight causes of damage which would leave unharmed more robust structures. But it seems not improbable that in the course of time we shall recognise that obscure poisons formed in the body as a result of faulty metabolism (autotoxæmia) are the causes of nerve-degeneration, as seen in the so-called "primary" affections.

* * * * *

Cancer of the
Intestine.

Few conditions are more surely fatal in the great majority of cases than malignant disease affecting the intestine, either large

or small. Surgical interference has seldom seemed to offer much prospect of more than temporary relief from the most distressing symptoms, and as a rule operation is not undertaken except with the object of establishing an artificial orifice for the relief of obstruction. Yet there would seem to be grounds for hoping that we need not regard malignant disease in this situation as beyond reach of treatment, and with the improvements which are being made in surgical technique we may expect to bring these cases into line with those of cancer elsewhere, and to effect in favourable instances a real cure of the disease by radical extirpation of the growth in its early stages. For this purpose it is necessary to be able to recognise the existence of the malady at its very beginning. Some useful considerations on this subject will be found in Mr. Clogg's article in our present number. The onset of constipation in an elderly person who has not previously suffered from this trouble is always to be looked upon with suspicion, and the coexistence with it of colicky pains increases the gravity of

the outlook. In such cases, especially if there be marked loss of flesh and strength, it will often be wise to make an exploratory laparotomy without loss of valuable time. If a growth be found and excision be possible, care should be taken, not only to cut wide of the actual growth, but also to excise the lymphatic vessels and glands, into which the region bearing the tumour drains. Such has long been the invariable rule of surgery in cases of cancer of the breast, and there is every reason to apply it as systematically to growths of the intestine or indeed of any part. Mr. Clegg does not regard very favourably the various mechanical devices which have been invented for effecting the anastomosis of cut portions of the gut, and there is much to be said against them. When the condition of the patient is such that time is a pressing factor, then it would seem that a button, for example, has considerable merits ; but apart from such pressure simple suture would seem in competent hands preferable.

Novelties and Notices.

"ARABELLA" NATURAL MINERAL WATER.

This water, derived from natural springs in Austria-Hungary, is shown by analysis to contain approximately 22 grammes of magnesium sulphate and 15 grammes of sodium sulphate per litre. This composition is well suited for an aperient mineral water. "Arabella" water has comparatively little taste, and the dose necessary to produce good effects is small (a wine-glassful to half a tumblerful with a little hot water). These advantages will be appreciated by patients. The water is well worthy of a trial in habitual constipation and other conditions in which aperient waters are so beneficial, such as the gastro-intestinal derangements which the public are fond of attributing to "a torpid liver."

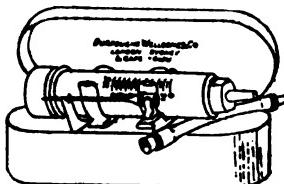
ANTIPHLOGISTINE.

This preparation consists of glycerine, boric acid, salicylic acid, iron carbonate, peppermint, gaultheria, eucalyptus and iodine, combined with the base dehydrated silicate of alumina and magnesia. It is thick paste, which can be applied with a spatula to inflamed parts; and by its hygroscopic and antiseptic properties it forms a very useful and soothing application, taking the place of fomentations and poultices. It is not a greasy preparation. Among other things, it acts as a remedy for the distressing irritation of chilblains and if it does this only, it may be welcomed as a useful addition to our remedies. It is manufactured by the Denver Chemical Manufacturing Co., whose London office is at 110, Cheapside.

AN ALL-GLASS SERUM SYRINGE (B. W. & Co.).

Messrs. Burroughs, Wellcome, & Co. have introduced a very useful form of Serum-syringe which is figured below. It is entirely made of glass, on the same model as the small

hypodermic syringe which we noticed in our January number last year. The instrument can thus be readily taken entirely



to pieces and sterilised, without risk of damage to any of its parts. Five different sizes are made, holding respectively 2, 3, 5, 10, and 20 cc. We recommend to those who need an instrument for ordinary use, either the 5-cc. or the 10-cc. size. The syringes are contained in metal cases which are easily rendered aseptic.

TABLOIDS "TRIBROMIDE" EFFERVESCENT.

The tabloids contain potassium bromide and sodium bromide, of each 0·4 gramme, and ammonium bromide 0·2 gramme. Each tabloid thus contains approximately 15 grains of bromide. One or two dissolved in water form an effervescent mixture containing a convenient dose of the mixed salts as usually recommended for use in epilepsy. The convenience of having the medicine in a solid form for those who have to take it over long periods during which they may be moving about, needs no demonstration.

ROYAL DOUBLE-CREAM CHEDDAR-CHEESE.

These little cheeses, weighing about 4 oz. each, and sold for 4d., well deserve a trial. They are agreeable in flavour, which is that of English Cheddar, and are made from pure milk. They may be recommended as a wholesome and palatable food, and are likely to become popular. They are made by the Somerset, Dorset & Devon Dairy Co., Ltd., Chard, Somerset.



Common Ailments and their Treatment.

ACUTE PNEUMONIA.

ACUTE lobar or croupous pneumonia presents a striking contrast, in the character of the dangers to which it gives rise, with bronchitis, with which we dealt in a recent number of THE PRACTITIONER. In the latter there is risk of an actual blocking-up of the air-passages with mucus, so as to produce death by suffocation. In pneumonia, although there is a large portion of the lung-substance consolidated, so as to be unavailable for purposes of respiration, death ensues, if at all, by toxæmia, not from asphyxia. Hence the treatment of the two diseases is on entirely different lines. In pneumonia, which tends to run a definite short course of about a week, terminating in crisis and rapid recovery, or in fatal intoxication by the poisons of the pneumococci, our aim is to support the strength of the patient by all the means in our power. We therefore avoid that shifting of the patient's position which we noted as being useful in bronchitis with a view to provoking cough and expectoration of mucus. What secretion there is in pneumonia from the diseased lung comes from the part which is already airless and useless for respiration. Hence we need not trouble much about removing the contents of the bronchi, and expectorant drugs are seldom of any value.

In the early days of the disease the most prominent symptom is frequently pain, which distresses the patient and prevents sleep. In young full-blooded adults the application of eight or ten leeches to the affected side may give great relief, and this may be followed by hot fomentations to encourage bleeding and increase the soothing effect. Sometimes the fomentations alone will be sufficient. If these remedies are ineffectual and the pain is very acute, there is no reason (apart from the co-existence of renal disease) for refusing to make use of the most effectual anodyne which we possess, morphine. An injection of $\frac{1}{8}$ or $\frac{1}{4}$ of a grain may be administered, if there be no sign of heart-failure, but it is well to give along with it 3 to 5 minims of the pharmacopœial solution of strychnine

in order to prevent any depressing effect. If there is sleeplessness apart from pain, a mixture containing 15 grains of chloral hydrate with the same quantity of potassium bromide may be given, 15 or 20 minims of sal volatile being added if thought advisable in order to counteract any tendency to depression. Or chloralamide may be substituted, 20 or 25 grains being given with a little extract of liquorice and water or chloroform-water. Another useful hypnotic is paraldehyde, and some authorities regard this drug as specially useful in pneumonia, possessing almost a specific effect. One drachm may be given for a dose in almond-mixture. The drug gives a peculiar offensive smell to the patient's breath.

Since the disease is essentially a toxæmia, the principal indication for treatment is to get rid of the poison from the system as rapidly as possible. It is by the urine chiefly that this can be done. With this object in view it is well to give a diuretic mixture. The dryness of the skin also suggests the advantage of some remedy which may cause diaphoresis. For these purposes we may administer a medicine containing citrate of potassium, 20 grains; solution of acetate of ammonia, 2 drachms; with syrup of orange, $\frac{1}{2}$ a drachm, and chloroform-water to an ounce. This may be given every 4 hours. Or instead, we may substitute 3 drachms of the solution of citrate of ammonia in the same vehicle. For mild or medium cases of pneumonia no further medicinal treatment is needed.

Some authorities speak highly of the use of quinine, 2 or 3 grains of the sulphate being given three times a day, or even every four hours. Dr. Burney Yeo recommends that it be given in an effervescing mixture; the quinine is made into a powder with some citric acid and a little sugar of milk, and the whole added to a draught containing bicarbonate of potassium or sodium and a little carbonate of ammonium, the mixture being made at the time of administration and drunk while in effervescence. Sodium salicylate has also been considered useful in many cases. Serum-treatment up to the present has proved disappointing in this disease.

The chief danger to be combated is failure of the heart. Warning of this is given by the frequency of the pulse. In ordinary cases of pneumonia this is not very greatly raised, but a rate exceeding 120 per minute is an indication for the

use of some stimulant. Alcohol is the usual kind employed, and it is advisable to begin with small amounts, such as two ounces of brandy or whisky in the 24 hours, and to increase them if necessary. Large amounts of this drug are in some cases needed, up to 12 or 16 ounces, but the necessity for these large doses is not common. In grave conditions of heart-failure a mixture of æther and ammonia (*R. Spiritus Aetheris, m. 20 ; Spirit. Ammoniæ Aromatici, m. 20 ; Tincturæ Aurantii, m. 30 ; Aquam Chloroformi ad unciam*) may be found useful; or strychnine may be given hypodermically in doses of 5 minims of the official solution. In cases marked by profound toxæmia the administration of oxygen-inhalations may sometimes appear to save life, but the gas must be given freely and almost continuously to have much effect, and recourse to this remedy should not be too long deferred, especially if there be any tendency to cyanosis.

Other indications for the use of alcohol are the occurrence of delirium, beyond the slight wandering at night which is common in all conditions marked by high fever; cyanosis; irregularity of the pulse and weakening of the tone of the first cardiac sound as heard at the base of the heart. When large or moderate doses of alcohol have been in use, it is unwise to withdraw them suddenly on the occurrence of the crisis, as this may be accompanied by a condition approaching collapse. The alcohol should be only gradually diminished as the patient's strength returns.

There is often constipation in cases of pneumonia. This need not cause anxiety. If the case be seen quite at the beginning (within the first two days) there is no harm in administering a dose of calomel followed by a saline draught; but later in the course of the attack it is unadvisable to make use of purgatives, as there is a tendency to diarrhoea at the time of the crisis, and this may be aggravated to a dangerous extent by aperient medicines. Should the patient complain of any discomfort from constipation, an enema may be used, but this is not often needed. The disease being short, failure of the bowels to act during the fever may be neglected.

For the same reason there is usually no need to attempt to reduce the temperature. A high temperature which only lasts a few days is unlikely to do serious damage to the tissues.

Tepid sponging is, however, often grateful to febrile patients, and there is no reason to fear to employ this in pneumonia. It may assist the sick man to sleep if done towards night. If hyperpyrexia occur it must be actively treated by cold sponging or even a cold bath.

During the fever the patient must be kept on liquid diet, consisting of milk and beef-tea. There is however no objection to flavouring the former with tea or coffee, or to giving cocoa or jelly (Brand's essence, Valentine's meat-juice, &c.) if they are appreciated. After the crisis the appetite and power of digestion rapidly return, and there is no need to exhibit the extreme caution which is necessary in cases of enteric fever, in increasing the diet in convalescence. Milk-pudding may be allowed on the second day, and a little fish or chicken on the fourth. But each individual case must be a law to itself in this as in all other particulars.

It is well to bear in mind that in elderly patients the resolution of the lung may in places be slow, so that some degree of dulness and bronchial breathing may persist for some days or even weeks at a particular spot without necessarily pointing to the presence of an empyema. As a rule, the formation of pus will cause the temperature to persist without the occurrence of a crisis, or to rise again after this has taken place. In young and vigorous persons any persistence of physical signs at one spot should, as a rule, lead to the exploration of the chest for pus, but in older persons a little time may be given, to see whether the signs clear up, before taking this step.

Another difference, beside that previously alluded to, between bronchitis and pneumonia in the matter of treatment is that in the latter there is no need to fear any ill effects from a good supply of fresh air, whereas in bronchitis it is often important to keep the air breathed by the patient warm and moist. Free ventilation is beneficial and generally appreciated by pneumonic patients, and the bed-clothes should be light and not too thick, as heavy coverings only add to the discomfort of these sufferers.

The liability of alcoholic subjects to contract pneumonia is well known, and from this arises the frequent association of delirium tremens with this condition. In fact, it is well always

to suspect the coexistence of pneumonia with this nervous malady, if there be any high degree of fever present. Alcoholic patients generally need to be supplied with some form of the drug during their illness, and it must not be cut off on account of the delirium. Sleeplessness must be met by some of the remedies above suggested. It is scarcely necessary to lay stress on the need for very careful watching of such patients for fear of their throwing themselves out of the window or otherwise injuring themselves. A male attendant will often be indispensable.

In convalescence some tonic will be of use. A mixture containing tincture of nux vomica, 5 minims ; sal volatile, 15 minims ; bicarbonate of soda, 15 grains ; spirit of chloroform, 10 minims, and compound infusion of gentian to 1 ounce, taken three times a day before meals, is often serviceable ; or quinine and iron may be administered after food in some such formula as : B. quininæ sulphatis, gr. 2 ; liquoris ferri perchloridi, minima 10 ; acidi nitrici diluti, minima 15 ; aquam chloroformi ad unciam. Misce, et fiat haustus, ter die sumendus post cibum.

THE PRACTITIONER.

M A Y, 1904.

TWO CLINICAL LECTURES ON PROGRESSIVE MUSCULAR ATROPHY.

LECTURE II.¹

By F. W. MOTT, M.D., F.R.S., F.R.C.P.,

Physician to Charing Cross Hospital; Pathologist to the London County Asylums.

GENTLEMEN,—

SINCE my last lecture on progressive muscular atrophy a case has been readmitted which is of considerable interest, because it is an illustration of the condition which ensues when not only the spinal segment of the motor path is affected, but also the cortical cerebral segment.

Case 10.—This patient is aged 36, is a labourer, and was sent into hospital on the 20th May last year for general weakness, especially in the back and legs, with a feeling of weight and pressure in the head. There is nothing in his family history of any importance. His past personal history is as follows :—

At the age of 19 he joined the army. He had rheumatic fever after joining, and at 23 years of age he seems, while at Hong Kong, to have had an accident in bathing ; a comrade struck him on the side when diving into the water. I do not think that this has had much to do with his present illness. When he was 20 he had syphilis, for which he was treated for a period of only one month. He left the army at the end of April, 1894, and then seems to have been well until 1898, at which date, when unloading a coal-waggon, he attempted to throw out of the way a piece of coal weighing $1\frac{1}{2}$ cwt. It was too heavy for him, and he says that the exertion twisted his neck, and a lump formed in his supra-sternal notch. Undoubtedly this lump was a gumma. Later on, a lump came on his head, but disappeared under the influence of treatment at St. Mary's

¹ Delivered at Charing Cross Hospital, Friday, January 29, 1904.

Hospital. So there is no doubt that he was suffering from tertiary syphilis ; and that, of course, may have something to do with his present disease.

When he came in here in May the following condition was observed. On inspection a very noticeable feature was the wasting of the upper limbs, especially of the left. Fibrillary tremors could be seen in many of the limb-muscles, especially on the left side. The deltoids and biceps, and the muscles of the forearms, thighs and legs were wasted. His hands were wasted, the left being claw-like. There seem to have been no sensory disturbances. In the circulatory system there was nothing particularly abnormal. With regard to the respiratory system, there was a little dulness at both apices ; the breath-sounds were weak, and moderately coarse crepitations were audible. In the infrascapular region there was said to be bronchophony, but I do not attach very much importance to that statement. While in the hospital, he noticed his voice was getting peculiar, and that it was difficult to pronounce words, so that people could not readily understand what he said. When he left the hospital in January, 1903, he noticed that he had gradually lost power in his right hand, and that he was unable to write so easily as formerly.

We see here what happens very often in these cases of progressive muscular atrophy, namely, bulbar paralysis. On the last occasion, you will remember, I could only show you three cases of ordinary progressive muscular atrophy ; therefore I will call your attention to the condition of this patient.

The present state of this patient, as recorded in the notes by Dr. Fenton, our Medical Registrar, is this :—The patient was previously admitted in July, 1903, and his case was diagnosed by me as amyotrophic lateral sclerosis. He has now become much worse. He lies on his back, semi-recumbent, seeming to prefer this to the horizontal position ; occasionally he groans as if in pain. He cannot articulate, although he tries to answer when spoken to. On admission he had incontinence of urine, but this seems to have passed off. He complains of frontal headache, which is continuous. He cannot lift his arms at all, but can move them slightly, and can move his legs. There is a slight power of grip in the right hand, but not in the left. The fingers are in a position of semi-flexion. The marked wasting of the interossei, and of

the thenar and hypothenar muscles, is readily visible. The power of both legs is weak, but equal. There is no wrist-jerk ; but the triceps-jerk is present in each arm. He has also marked wasting of muscles about the angle of the mouth, and diminished, but fair power in the muscles of the lips. He can protrude his tongue almost to the full extent ; there is a little tremor in it. There is occasional fibrillary tremor as it lies at rest on the floor of the mouth. There is fair symmetrical movement of the soft palate and uvula. He can also open his mouth. The muscular power of the eyes and eyebrows, and the movements in connection with them, appear to be unaffected. Hearing, taste, and smell are good. The pupils react normally ; the eye-movements are normal ; there is no nystagmus.

The movements of the upper extremities, you will observe, are extremely limited ; grasp on both sides is very weak. If you come and look at him afterwards you will be able to see for yourselves the extreme weakness from which he suffers ; he gives only the feeblest grasp. The biceps muscles on both sides are markedly wasted, more especially the right. The triceps is comparatively large on the right, somewhat wasted on the left. There is wasting of the deltoids, also more marked on the left. The pectorals appear of fair size, but the left is appreciably smaller than the right. The supra- and infra-spinatus muscles are gone, and the erector spinae is much atrophied on both sides. So you see there is a very curious distribution of the muscular atrophy. The upper part of the trapezius is just present, and that one usually finds ; it is the part which is last affected, as a rule. Other muscles attached to the scapula are markedly wasted, but owing to the patient's condition it is difficult to make out their state individually. The sternomastoids are flabby, and exhibit fibrillary twitchings. The muscles of the thighs and calves are normal in size, but show fibrillary twitchings. The muscular power of both legs is comparatively fair, and sensation is intact.

Reflexes.—The deep reflexes are exaggerated on both sides, and Babinski's sign is present. The knee-jerk is present on both sides, and there is slight ankle-clonus ; "patellar tap" is also present on both sides. Jaw-jerk, wrist-jerk, supinator and triceps jerks are all exaggerated ; in fact, practically all the deep reflexes are markedly exaggerated. When we come

to speak of the pathology you will understand why that is so. The abdominal reflexes are obtained with difficulty ; the epigastric is present.

He is reported to swallow slowly and with difficulty. So far, nothing has regurgitated through the nose. On the whole, he is in a very miserable condition, unable to move, and unable to articulate properly. On account of his difficulty in swallowing, one has to be very careful in feeding him, because if food were to get into his air-passages, it would set up broncho-pneumonia, as was pointed out in my former lecture. In a disease very closely allied to this, in which there is also a mental affection, namely, general paralysis, that is one of the common causes of death ; but in such a case the patient has not the sense to know that the food is going the wrong way, or he does not cough sufficiently to expel it. In this man's case the difficulty arises not from mental, but from muscular defect ; his sensibility is perfect, but he has not the power to expel the food if it does get down the wrong way. So we have to give him soft food, and when he is taking fluid, we have to put him into such a posture that it will not readily run down the trachea.

The loss of power of movement in amyotrophic lateral sclerosis is due not only to degeneration of the anterior-horn cells which preside over the movements of the muscles and directly innervate them, but also to degeneration of the neurons which control the action of the anterior-horn cells, namely, the structures which are found in the motor area of the cerebral cortex. In most cases of progressive muscular atrophy there is an affection of both upper and lower segment.

It has been shown that in the cortex cerebri the large pyramidal (Betz) cells, which control the action of the anterior-horn cells, are all situated in front of the fissure of Rolando, or in the anterior wall of the fissure itself. There is, I may remind you, as much cortical grey matter in the fissures as there is actually on the surface, and it is the throwing of the cortex into convolutions that enables the brain to have a larger expanse of surface than it otherwise would, without increasing its size. Hence what you see on the surface does not represent the whole area which is concerned with voluntary movement. Part of the motor area is superficial, and part

extends to the bottom of the fissure ; or, more exactly, occupies its anterior wall. Sometimes the disease begins primarily in the motor cells of the anterior horns, sometimes it begins primarily in the neurons of the cerebral cortex ; but more often it begins in the two simultaneously ; and then, of course, according to the number of neurons which are affected, you will get different clinical symptoms. But in all cases where there is wasting of the anterior-horn cells, you must have the nutrition of the muscles affected ; whereas if only the upper segment is affected, the anterior-horn cells not being affected, you will find the nutrition of the muscles preserved, although the voluntary power over them is considerably interfered with, according to the amount of degeneration in this upper segment of the motor path. You would perhaps say that the will is affected, but that is not exactly the case. It is the instrument of will which is affected. Volition means *deliberation* and judgment, the choice of action, the determination as to what you will do under the influence of stimulus to action. This man is able to decide what he would like to do, but he is unable to carry it out, and that is because the downward path from the brain to the muscles is interfered with. Of course that condition makes his illness all the more painful to him, as he is unable to move, to write, or to express his thoughts by speech. But in other diseases,—for example general paralysis,—you may have this tract, which constitutes the instrument of the will, uninterfered with, but you have the other structures of the brain, which are concerned with the functions of the mind, affected ; and in such a condition the will, or volition, is seriously affected, as well as the instrument of the will.

The reason why there is no defect of sensibility in progressive muscular atrophy is, that the path by which sensations are conveyed is not in the least affected in this disease. The posterior spinal ganglion of the peripheral sensory nerve is not affected at all ; neither is the pathway in the cord, which is through the posterior columns and posterior horns. The lesion is limited to the efferent path from the cerebral cortex to the grey matter, and from the grey matter to the muscle. Consequently, if you remember the pathology, and keep in mind the anatomical relations as shown in the accompanying

figure, you cannot get wrong with the symptoms, because it is purely a motor affection.

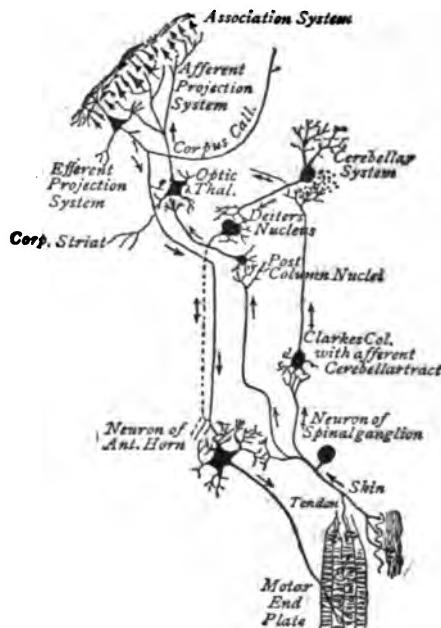


Fig. 1. Diagrammatic scheme to show (1) the afferent paths concerned in common and tactile motor sensibility; (2) the efferent path from the cortex cerebri concerned in voluntary movement; (3) the afferent and efferent cerebellar paths. (It will be observed that there are three reflex circles—spinal, cerebellar, and cerebral). (4) In the cortex cerebri are represented the tangential fibres and the layer of pyramidal association-neurons.

We know that one of the earliest situations for the atrophy to commence is in the small muscles of the hand, and you are aware that claw-hand is a very common result of it. Now, claw-hand is due to paralysis of the interossei and the lumbricales; and these small muscles of the hand which are innervated by the ulnar nerve would be supplied by the motor neurons in the last cervical and first dorsal segments. You have three groups of cells in each anterior cornu. In progressive muscular atrophy you will see that the horns are flattened,

and that the outer and middle groups of cells disappear ; not so much the inner ones, because they do not give rise to the anterior root-fibres. You will find the anterior roots also atrophied ; and if the cells are gone, the fibres must be gone which lead to the muscle. At one time it could not be explained how it was that, although the anterior-horn cells were gone, yet the muscles seemed to have a large number of fibres still passing into them. Now it is known that nearly half the fibres which enter a muscle are really sensory fibres connected with the muscle-spindles ; and it is these fibres which persist. That explains why, although the anterior-horn cells and roots were destroyed, you yet saw fibres entering the muscles.

The changes in the cells are chronic, and you will find normal cells lying by the side of others which are considerably damaged. That will explain why the muscle-fibres still give a reaction to the faradic and galvanic current in the earlier stages, or even in moderately advanced cases. It is because some of the neurons are still intact. In some of the cells you see the Nissl granules perfectly clearly. Another cell in the neighbourhood will appear partly degenerated ; the processes are broken off, the cell is shrunken, and the nucleus shows hardly any Nissl granules at all ; there may be just a few and a patch of pigment. Another one is perhaps still more decayed ; one can then only see a little bit of protoplasm, and in it some pigment. And finally, nothing is left except the pigment, marking the place where the cell existed. In this anterior-horn region of the cord you will see cells in all stages of change. It cannot be a vascular condition which gives rise to this degeneration, because if the lesion were of such a nature, it ought to have also affected the other cells in the cord. Neither can we explain how a vascular condition would pick out one cell and leave another in its immediate neighbourhood intact. It must be, therefore, a primary decay of the neuron itself ; and that is what one means by saying that the disease is a primary degenerative process, rather than a secondary degenerative process caused by vascular occlusion or inflammation.

Pari passu with this atrophy of the cells you see a change taking place in the glia-tissue. The glia-tissue must fill up the

space which has been occupied by the nerve-cells. The nutrition which went to the anterior horn was very considerable, and is no longer utilised by the "master" cell-elements; therefore it is utilised by the "servant" tissue, the structural framework of the grey matter, namely, the neuroglia cells. Consequently you see taking the place of those cells a large number of spider-cells, with branching processes. These cells are found only in the particular region of the cord where the atrophy occurs.

If you examine a case in which only the lower segment is affected, that is to say, only the spinal motor neuron, you will find degeneration only in that region of the cord where the anterior roots pass out, and in the motor fibres of the mixed spinal nerve. But besides that, with such an amount of destruction of the grey matter, there are involved also the commissural cells of the grey matter—cells which give off an immense number of fibres into the antero-lateral column, and which serve to unite the different segments of the cord at different levels, and effect the coördination of the various segments. You will thus find in many cases a considerable shrinking of the antero-lateral columns, which is not due to a destruction of the anterior roots only, but also to atrophy of the spinal association-tracts.

If the upper segment is affected as well as the lower, you will have the following degeneration. The direct tract on both sides of the anterior median fissure is degenerated. The crossed pyramidal tract also is degenerated. The posterior columns are not affected at all; therefore there is no interference with the tactile sensation and the muscular sense. The whole degeneration is in the motor efferent tract. When you have the pyramidal tracts affected, together with an atrophy of the muscle, then you have what is called amyotrophic lateral sclerosis; that is to say, there is degeneration of the cells in the anterior cornua, or they have disappeared in a great measure—resulting of course in wasting of the muscles—along with an exaggeration of all the deep reflexes, provided that the lesion of the upper neuron is in excess compared with that of the lower. If a large number of anterior-horn cells are wasted, you cannot have an increase of reflex tonus, because there are no cells left to produce it. But

if there are a good proportion of cells left and you have the upper neuron markedly affected, of course the reflex tonus in the muscle-fibres which are left is exaggerated, and you get all the deep reflexes increased. Some of these cases begin in such an insidious way that it is difficult to decide which tract is first affected. I have examined a number of these cases. Sometimes you can trace the degeneration right up by the ordinary Weigert method to the pons; sometimes you can trace it higher, into the crus cerebri. In advanced cases, as I expect you would find in the one which we have studied to-day, you can trace the degeneration up into the cortex.

Now in every large pyramidal neuron, the nucleus represents the trophic centre, and the further you get from it the greater the likelihood, when there is nutritional disturbance, for the part to atrophy. The first parts therefore to die are the fine terminal collaterals of the pyramidal neurons. The axis-cylinder processes might persist in the lateral tract and show no alteration; the degeneration being at first all in the fine plexus in the anterior horns. Cases have been recorded where all the symptoms of amyotrophic lateral sclerosis have been present, namely, progressive muscular atrophy with exaggerated reflexes, and yet no degeneration was found in the pyramidal tracts. The only explanation is the one which I have given you, namely, that the axis-cylinder has not wasted, but only the terminal collaterals which end in the grey matter. Other cases have been described where a degeneration could be traced up as high as the medulla and the pons; others where it extended as high as the internal capsule; and others again where the cortical cells were altogether destroyed.

There are present in the cerebrum three layers of cells and two of fibres. There are fibres and cells in each layer, but there is a predominance of fibres in certain layers and a predominance of cells in others. The layer on the surface is called the tangential layer. Beneath that you have the layer of "pyramids." These pyramidal neurons are connected with association; they have nothing to do with the afferent or efferent paths. They are simply the cells which give off fibres connecting the motor area with other regions of the brain. Beneath that you have a layer of "granules," which probably represent terminal reception-neurons for sensory fibres. Then

there is a layer of fibres in which are set these very large motor cells, called "Betz' cells," the apical processes of which terminate in the superficial layer. Beneath that there is another layer of cells called "polymorphic." Now, if we take out these big cells, the rest of the constituents are common to all the brain. It is the interposition of these large cells in this part of the brain which makes it absolutely different from all other parts of the cortex in function and in histological features. They are called Betz' cells because he first described them. They resemble anterior-horn cells in shape and size, and are especially large at the top of the ascending frontal convolution, because the cells in this region give off the longest fibres, which come down to the lower end of the cord, and innervate the spinal motor neurons presiding over the lower extremities. In the arm-area they are smaller, and as you get to the portion which innervates the face they get very much smaller, and you cannot readily distinguish them from the cells of the deeper layers of the pyramids. The axis-cylinder processes of the Betz' cells give off fibres which pass through the corpus callosum to the corresponding region on the other side.

This structure, which I have described as peculiar to the motor area, is very interesting indeed ; and the fact that the disease which we are considering is a primary degeneration is absolutely proved by the observation that in it one finds the Betz' cells alone disappear, while all the other cells remain ; they behave as regards degeneration exactly the same as anterior-horn cells do. Until we knew something about the structure of the brain we could not determine that. I have specimens from one case in which, instead of seeing these cells, you see little foci of degeneration filled with spider-cells. Under the microscope we can see a marked degeneration of large fibres scattered through the deep layers of the cortex, and they are the degenerated fibres which come from these cells.

In general paralysis you may have a disease of these cells, that is to say, the cells may be destroyed, and there may be exaggerated reflexes, as in progressive muscular atrophy ; but the pyramidal association neurons are degenerated as well, not merely in the motor area, but in the whole cortex, especially of the anterior two-thirds of the brain. The degeneration begins in the tangential-fibre layer and in the layer of pyramids,

and really the loss of mind depends practically upon the amount of destruction of these. In a case of amentia—that is, congenital absence of mind—there is defective development of the cortex cerebri; and degrees of absence of mind depend upon the degree of defect.

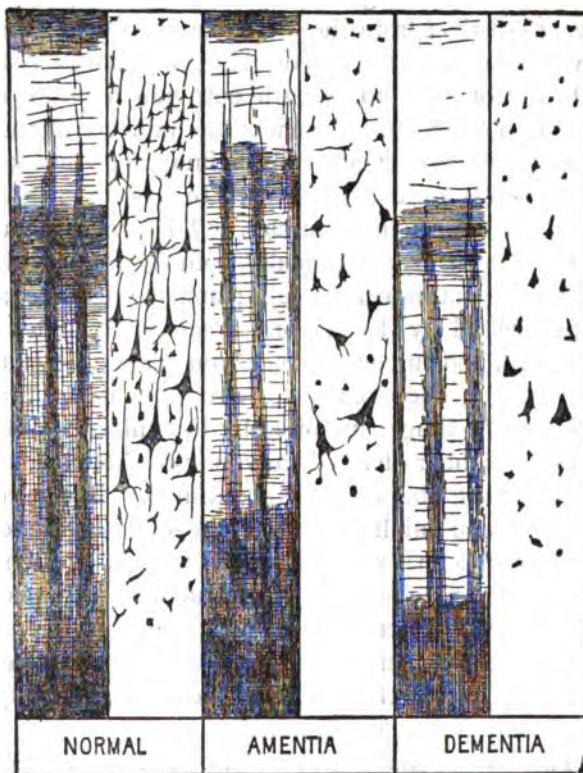


Fig. 2. Diagram to show the cells and fibres of the cortex cerebri in the normal brain, in amentia (absence of mind), and in dementia (loss of mind). It will be observed that in the pathological conditions the fibres and cells of the cortex are diminished in proportion to the mental defect; also that the cells are ill-shaped, and not arranged in definite columns. In amyotrophic lateral sclerosis the only cells degenerated are the large pyramidal cells in the deep layer; there is no change therefore in the great majority of the cortical neurons, and no mental defect.

This patient's mind is not affected at all ; his volition is perfect, but the instrument of volition, the nervous structures concerned with the voluntary path from the cerebral cortex to the muscle, has gone. It has not yet all gone, but it is progressively disappearing. It affords a very valuable indication, to my mind, of what regions in the brain take part in mental processes, as distinct from the mere exercise of the mind on the structures of the body. And you will understand why it is that, if you have got the motor path cut, you have all the deep reflexes exaggerated; because under the influence of unconscious cerebration you are continually stimulating (unconsciously) those nerve-cells of the motor path to exercise restraint upon the reflex tonus of the muscles. This tonus results from impressions which are continually coming from without and stimulating the anterior-horn cells; and if you take away the restraint exercised by the cerebral neurons, the reflex tonus is not controlled, and in consequence you have an "exaggerated reflex." All the deep reflexes are exaggerated, because the reflex tonus is no longer inhibited by the influence of the brain. You must remember that all nervous processes are practically reflexes, but that the reflex is continually being controlled by impulsion and inhibition. We speak of the "action" of the brain on the spinal structures; but it is more often engaged in restraining the action of these structures. In people who lose that restraining action the flow of ideation increases and their impulsiveness increases. We are continually restraining our activity owing to the fact that we are continually judging what the result of our action will be.

We may trace the course of the motor path as follows. The fibres come out like a funnel from the motor area, and the neck of the funnel is the internal capsule. They pass over to the opposite side, in the pons and medulla, and come down the cord. Consequently the course of degeneration will be successively the collaterals in the grey matter of the cord; the crossed pyramidal tract and direct pyramidal tract; then in the pyramids of the medulla; then in the pyramidal systems of the pons; then in the middle wedge of the crus; then in the anterior two-thirds of the posterior half of the internal capsule; then in the corona radiata, and finally in the cortex cerebri, corresponding with the fourth layer of the cerebral cortex in

the ascending frontal convolution and the anterior wall of the fissure of Rolando. The degenerative changes affect the cells in the anterior horns and their homologues in the medulla and pons, particularly the lower part of the medulla, the group of cells situated in the *calamus scriptorius*, and the top of the central canal, called the glosso-labio-laryngeal nucleus. The anterior-horn cells are affected especially in the lower cervical region, and about the level of the fourth and fifth cervical nerves (corresponding with the deltoid and biceps muscles), in the lower cervical region, corresponding with the innervation of the small muscles of the hand, and in the lumbo-sacral region with the muscles of the lower extremity. Along with degenerative changes in the anterior-horn cells, we find atrophy of the anterior roots, of the motor fibres of the mixed spinal nerves, and of the terminations in the muscle-fibres. There is also, of course, atrophy of the muscle-fibres themselves. Thus the whole efferent path of volition is affected.

One word more about this. Recent experiments have established two facts :—(1) That the direct pyramidal tract does not exist in monkeys: it is first found in anthropoid apes, the gorilla and chimpanzee, and therefore it is probably specially connected with the hand. The erect posture of the anthropoid ape compared with other monkeys which run on all-fours indicates a special use of the hand. Moreover, you find that the direct tract disappears just below the second dorsal nerve in most cases. But although it is called the direct tract, the fibres decussate in the anterior fissure and go across to the other side. It is a prolongation of the pyramidal decussation down the cord. You will nearly always find the direct tract markedly degenerated, along with the crossed pyramidal tract.

(2) Another point is, that it is stated, as the result of experiments, that the fibres of the pyramidal tract do not end directly round the anterior-horn cells. One finds in the cord an immense number of cells. But the motor cells, which innervate the muscles, are comparatively few in number in comparison with the other cells. As in the cerebral cortex, so in the cord, but to a much less degree, there are a large number of association-cells in the grey matter. The pyramidal fibres, instead of going to the anterior-horn cells, end at the base of

the posterior horn, in association with cells which bring into relation the fibres of the posterior roots as well. The impulses coming from the brain can thus inhibit the incoming stimulus by the posterior root. If you cut off that cerebral influence, of course the reflex tonus is increased, and there is therefore an exaggeration of the deep reflexes. But besides that path we have probably another which goes more directly to the anterior-horn cell ; and that may be the path connected with the augmentation of the impulse. Probably there are two forces acting on the anterior-horn cells : one of inhibition, and the other of impulsion ; and it is the correlation of the two, and the adjustment of the activities of the one path to the other which enables us to estimate exactly the force required to perform a movement with the least expenditure of nervous and muscular energy ; that is perfect coördination.



RELAPSING FEVER IN EGYPT.

By F. M. SANDWITH, M.D., F.R.C.P.,
Consulting Physician to Kasr-el-Ainy Hospital, Cairo.

Synonyms :—Famine fever—Fièvre à rechute (*Fr.*), Homa el Rugga, Homa el Naxy, or Naushah (*Ar.*).

HISTORY.

Hippocrates described an epidemic of relapsing fever occurring with other fevers under his own observation in the Island of Thasos. Among other cases he quotes the sudden onset of the disease in two brothers : in one the initial fever lasted seven days, in the other six ; the intermission in one five days, in the other six ; and the relapse in both five days. But it is remarkable that relapsing fever does not seem to have attracted attention as a special entity for nearly twenty-two centuries after the time of Hippocrates.

In the year 1201 A.D., Egypt was cursed with a very low Nile and a consequent famine, described by Abd-el-Latif, during which many human beings were devoured by their relatives and others. The large town now called "Old Cairo" became almost deserted, and hundreds of dead were removed daily and left to rot outside the walls, while many of the towns and large villages in the Delta suffered to a proportionate extent. It is not surprising that a terrible pestilence should have broken out among the miserable survivors, and this was followed by an earthquake, after which came a high Nile, and peace and prosperity were gradually restored, though Old Cairo was not repopulated. It is quite possible that the fever which accompanied this famine was partly relapsing, though this is mere conjecture.

In 1797–1800 the French doctors of Napoleon's army saw relapsing fever in Cairo, and Barbes pointed out that the jaundice, though accompanied by relapses, resembled the yellow fever of America. Larrey, under the heading of "Yellow fever, complicating gun-shot wounds," describes a fever which succeeded the siege of Cairo in the spring of 1800 ; this was so

sudden in its onset, so contagious, and so fatal to the wounded, that the French soldiers believed that the bullets of the besieged must have been poisonous. There died at this time 260 wounded out of about 600 attacked, but the epidemic was stayed directly Cairo surrendered and the French army was relieved from its privations and unhealthy surroundings. The chief symptoms were jaundice, fever, thirst, pain in the head and right hypochondrium, epistaxis, vomiting of bile, occasional delirium, and a marked crisis, sometimes followed by a relapse. When the city had fallen the besieged garrison was found to be suffering from a similar disease, which probably consisted of both relapsing fever and infectious jaundice (Weil's disease).

Veit and Pruner wrote of a fever in Cairo, attended by a small mortality, which ended abruptly on the fifth or seventh day, but was liable to relapses, and sometimes lasted altogether twenty-two days. Since then Russegger and Hartmann have written of "biliary typhoid and famine-fever" as being often epidemic in the poorest districts of Egypt and the Soudan; but it was not until 1842 that physicians in Scotland pointed out the difference between typhus and relapsing fever, and to Griesinger was due the credit in 1851 of having first differentiated this fever from typhus, enteric, and the "biliary typhoid," which is still called in Egypt "Griesinger's disease." In 1873 Obermeier, assistant to Virchow in Berlin, discovered the spirilla in the blood of relapsing-fever patients, and these were first found in Egypt by Engel Bey in 1884. But in spite of Griesinger's writings, his name and this disease were unfortunately quite unknown to me and others in Egypt, when, a week after my appointment to the Sanitary Service, I discovered in February, 1884, an illness which had been returned as "typhoid" in a little mud-hut village near Benha. The fever had lasted twelve days, and had already attacked 98 people, of whom I examined 27. Their clean tongues, constipation, and healthy motions, made me certain that the epidemic was incorrectly named; but I was puzzled for a time, until the interpreter showed me one case which was undergoing a second bout of fever after a feeble attempt to work in the fields. The chief symptoms were vomiting, temporal headache, prostration, constipation, temperature $40.3^{\circ}\text{C}.$, pulse 130, and no sign of

eruption, and a history of only one death. Though I had never seen a case of relapsing fever, I fortunately remembered Dr. Murchison's graphic lectures on the subject, and at once decided on the diagnosis, which was later confirmed by the presence of spirilla in the blood. These villagers all vowed they had plenty to eat, and the experience of this and later epidemics has been, that it is rather the quality than the quantity of food which is at fault in Egypt.

In April, 1884, I again had the opportunity of seeing relapsing fever in an epidemic which had also been returned as "typhoid," from Basateen village, four miles south of Cairo. During the same year, there were five other small outbreaks of relapsing fever occurring in different villages, numbering about 200 cases in all ; one of them was a village near Zagazig with cases of typhus as well as relapsing fever.

Since my re-discovery of this disease in Egypt, small outbreaks have been reported to the Sanitary Department every spring, sometimes with, and sometimes without, typhus. During the Tourah mixed epidemic there were several hundred cases of relapsing fever, and I took notes of 118 of them.

DISTRIBUTION.

Relapsing fever is distinctly more commonly heard of in Lower Egypt than in Upper Egypt or the Soudan ; but it must be remembered that in the Delta, not only is the climate colder, thus leading to more overcrowding indoors during the winter, but also the population is much more numerous. It still sometimes exists in provincial prisons, in spite of improvement in hygiene (eight deaths in the year 1902), but it is not known in the English or Egyptian armies. I have never seen an instance of it in a European, except the following :—In May, 1892, I was summoned to Suez to see an English doctor suffering from slight diarrhoea and a continued temperature between 40° and 41° C. I made out that he had been ill for six days ; and while I was hesitating as to the diagnosis, epistaxis and slight sweating occurred, and the temperature fell to normal. It was then obvious that the case was one of relapsing fever, and the patient stated that he had been specially interested in a hospital case which he begged me to see, because he was uncertain of its nature ; on examination

the presence of typhus among them. I have notes of only eight cases in which a rash could be found ; in four of them there were a few faint, reddish spots which only lasted a few hours ; in a fifth case I found some tiny ecchymoses in the left axilla, but not elsewhere ; and in the three remaining cases there was a real eruption, of which the following are notes of a mild attack :—

Case 1.—A light-coloured Egyptian hospital-clerk, aged 40, had been employed for a month in keeping diet-sheets and in other clerical work which took him daily into the relapsing wards. One evening he was suddenly taken ill with headache, fever giddiness, general pains and bilious vomiting, but no rigor. On the 3rd day his temperature was $39\cdot 4^{\circ}$, his pulse 112 ; he complained greatly of headache ; he was sleepless, and his bowels were opened after a purge. On the 4th day the pains were better ; there was slight headache, but no eruption. Temperature, $38\cdot 6^{\circ}$; pulse, 120. On the 5th day his temperature was 39° and his pulse 126 ; he was giddy, and complained of headache, but slept well ; there was a small petechial eruption all over his back, chest and shoulders, like large flea-bites, but without puncta. He felt much better, but was frightened by seeing the eruption. On the 6th day crisis occurred. His temperature fell below normal, and he said that he was quite well and wanted to return to his work. The eruption had completely disappeared from the back, but was still faintly present on the chest and front of the axillæ. On the 7th day his temperature was sub-normal, and the eruption had quite gone. On the 19th day convalescence continued without relapse, and he was allowed to leave the hospital.

The temperature often reaches a maximum of $41\cdot 1^{\circ}$ C. (106° F.), though in many cases it never rises above 40° . The highest temperature which I have ever taken myself was $42\cdot 1^{\circ}$ ($107\cdot 9^{\circ}$ F.). The greatest drop in temperature during the crisis that I have seen was 5° C., from $40\cdot 4^{\circ}$ to $35\cdot 4^{\circ}$. In other cases I have seen the temperature fall from $41\cdot 1^{\circ}$ to $36\cdot 6^{\circ}$, and from $40\cdot 6^{\circ}$ to 36° . The sudden loss of fever and subsequent sub-normal temperature for a few hours or even a few days is quite pathognomonic of a typical case. A very high temperature before the crisis seems to cause the patient no greater inconvenience than a moderate degree of fever.

Sweating takes place to a slight extent during the fever, and the very profuse sweat which accompanies the crisis and soaks the bed-clothes for some hours is most marked. When I have examined the sweat, I have always found it to have an acid reaction. The skin remains cold and clammy for two or three days after the crisis.

The *odour* from the skin is musty, and is most marked in some cases, but never so strong and penetrating as in typhus.

The *pulse* during high fever varies generally from 120 to 132 ; in exceptional cases it rises to 150, and once I counted it 168. In many cases the pulse-rate is as high on the first day of the fever as later. At the crisis the pulse usually falls from about 120 to 96, but in exceptional cases I have seen it fall in a few hours from 125 to 66, or from 152 to 84.

The *respirations* usually rise and fall with the pulse-rate, but I have sometimes counted them between 48 and 60 during high fever. A slight cough with scanty bronchitic sputa is occasionally present.

The *tongue* in a very large number of cases continues moist and clean throughout the attack, thereby furnishing a very useful aid in diagnosis from typhus or enteric fever, but giving no information as to the height of the fever, or as to the presence of diarrhoea. A clear, triangular space at the tip is often present, the rest of the organ being covered with a thin whitish fur. The tongue is very seldom flabby, or indented by the teeth ; it is not tremulous and can nearly always be protruded. In very bad cases it may become dry, brown, and fissured. During the fever there is of course a loss of appetite, and I have never seen any voracity after the crisis.

Thirst is a constant symptom, and men racked with pain will leave their beds to gulp down many cupfuls of water.

Vomiting occurs often at the beginning of the attack, and nausea is always complained of. The vomited matter is watery and tinged with yellow-green bile, but is never coloured by blood. Gurgling, iliac tenderness, and tympanites are not present.

Epigastric pain is complained of by most patients at the beginning of the fever, and is sometimes very severe. During the fever there is always tenderness upon pressure in the

epigastrium, or in one hypochondrium or both, though the liver usually cannot be felt to be enlarged.

The liver and spleen are, however, sometimes both painful and enlarged. One patient, on admission, complained of giddiness, and pain in his spleen and epigastrium, which produced very laboured breathing, though his respiratory organs were normal ; his spleen measured 7 inches vertically, and was very tender to the touch. The microscope showed spirilla, and very numerous leucocytes, over 100 being in the field at once. (Temperature, $40^{\circ} 1$; pulse, 144.) Two days after admission his crisis came, and the spleen slowly resumed its normal size.

Case 2.—A prison warder, exposed to the infection of relapsing fever, caught that disease on May 15, and was treated for it at Kasr el Ainy until June 2, when he went to his own house cured. He returned to his prison and caught relapsing fever a second time on June 17 of the same year, when I again saw him. He was groaning with pain, which was chiefly in his back and abdomen, jaundiced, and with small pupils. (Temperature, $40^{\circ} 2$; pulse, 116.) His spleen measured 8 inches vertically, of which 3 inches were below the ribs ; the liver measured 10 inches in the right nipple line, extending 5 inches below the ribs. On the 9th day crisis occurred ; he had no pain ; his temperature was $35^{\circ} 5$, and his pulse 84 ; his tongue was very red, moist and rough. On the 10th day his temperature was $36^{\circ} 5$, and his pulse 72 ; jaundice continued, and the spleen measured 7 inches, the liver only 6 inches. On the 14th day his temperature was still sub-normal ; his tongue was clean and moist, and there was no jaundice ; the spleen only measured 3 inches, and could not be felt below the ribs ; the liver measured 5 inches, of which half an inch was below the ribs. There was no relapse.

Jaundice, in my experience, is present in one out of every ten cases ; but whereas the proportion among survivors is only 4 per cent., that among fatal cases is as high as 47 per cent. There is no doubt that this symptom is more frequent and more intense in severe than in mild cases, and I have never seen it during a relapse. When it occurs in prostrate patients with delirium and dry, brown, fissured tongue, it is extremely useful in diagnosing the disease from typhus.

Constipation is present in most cases on admission.

Diarrhoea is sometimes an early symptom, and often occurs at or after the crisis. Dysentery I have seen four times in convalescing patients.

The urine is usually normal, unless patients are approaching the "typhoid state," when a little albumen and scanty secretion of urea will be found. Bile-pigment is present if there is jaundice.

Headache is almost invariably frontal ; it lasts all through the paroxysm, disappears at the crisis, and returns again with relapse.

Giddiness is also a very prominent feature, and is one of the earliest symptoms, lasting till convalescence. Many patients fall to the ground while trying to overcome their vertigo by walking.

Bone-pains are usually considered the principal symptoms by the sufferers ; they begin early, and usually subside with the paroxysm, but in some bad cases they continue throughout convalescence. The knees are the part usually affected ; but very often the pains are too general to be at all localised ; they are never attended by local heat, redness, or swelling. This is the symptom for which patients demand relief, and which afterwards remains longest in their recollection. They usually state that the pains are in their bones, but this term includes also pain in the joints and neighbouring muscles.

Delirium occurs in 13 per cent., mostly during the paroxysm, but in rare cases continuing for a day or two after the crisis. Occasionally the delirium is acute, noisy and shouting ; but more often the patient merely seems to be unduly happy, and is often a great source of amusement to his neighbours. On one occasion a fellah staggered outside the hospital tent to drive an imaginary buffalo out of a corn-field.

Three times I have seen *stupor*, which lasted through the febrile period, and well into the intermission, making it difficult to diagnose from typhus.

Sleeplessness is a common symptom, due to high fever and bone-pain.

Organs of Special Sense.—The pupils are usually normal, but I have seen them contracted in four cases and dilated in two others. The patients often complain of singing in the

ears. Epistaxis is a rare accompaniment of the crisis, and in one of my cases was very profuse. Hyperæsthesia I have only seen once, in a bad case.

CLINICAL STAGES.

After the primary paroxysm of fever comes the *crisis*, with its grateful relief, deep sleep, coldness of skin, and the sweating that I have already mentioned.

The *intermission* varies from six to twelve days, and may extend to fifteen. I have seen dozens of patients grumbling at being kept in hospital, because they felt perfectly well and wanted to return to their homes ; yet on the following day they were again feverish and groaning with pain and thirst.

The *relapse* is by no means a certainty, but it occurred in 68 per cent. of my patients, its average duration being three days ; but I have several times seen it last only one day, and on one occasion it extended to nine days. At the beginning of an epidemic relapses are the rule, but as it approaches its end they become less frequent. The relapse, when it occurs, is a modified condition of the first paroxysm, and, like it, comes on without warning, but in it diarrhoea seems a more frequent and more serious complication, partly because the patient is exhausted by the previous fever. I once, however, saw the temperature in the relapse much higher than in the primary fever. A man whose maximum had been previously only 39° C., reached 41° on the first day of his relapse ; his temperature on the second day was $40\cdot 9^{\circ}$, and on the fourth day it fell to $35\cdot 7^{\circ}$ with the occurrence of the second crisis.

The *second crisis* is similar to the first, except that diarrhoea often attends the copious sweating and other signs of relief.

Convalescence is sometimes slow after all disappearance of the fever, but this depends chiefly on the condition of the individual before he contracted the disease. A *second relapse* occurred in 11 per cent. of my cases, and never lasted more than three days, seldom being of more than one day's duration. It caused pain and distress to the patient, but otherwise was of no clinical importance. A *third relapse* I have only seen in one case, and that only lasted one day.

No *relapse* took place in 32 per cent., but all these occurred at the end of epidemics.

It would seem that one attack of relapsing confers but little immunity, for besides *Case 2* I have seen four others who underwent a second attack of relapsing fever, with generally an interval of only four or five weeks between the last relapse of the first attack and the primary paroxysm of the second attack.

A hospital attendant at Kasr-el-Ainy underwent relapsing fever there in July, 1893, and again suffered from it there in May, 1894.

MORTALITY.

Murchison's death-rate of 4 per cent. is quoted in most English books, but there are records in other countries of much higher mortality—for instance, of 18 per cent. in India and of 14·9 per cent. at St. Petersburg (1865).

In Egyptian villages I have seen instances of 12 cases without a single death, 11 cases with 1 death, 15 cases with 1 death, and once 33 cases towards the end of an epidemic with no death at all. On the other hand, there have been larger outbreaks in villages with a mortality of 11 or 12 per cent., even when typhus has apparently been quite absent. At Tourah, including all deaths, I had 17 fatal cases, or 14·4 per cent., but only 4 out of the 17 died during the first 15 days of the illness, thus reducing the rate to 3·4 per cent. One man died of peritonitis, 2 of pneumonia, 2 of dysentery, and the others from prolonged diarrhoea and exhaustion. Only one man died during the primary paroxysm on the 6th day.

Case 3.—Relapsing Fever; Death.—A light-coloured convict was first seen by me on the 4th day, when his temperature was 38·8°. He was very weak, and his bowels were opened eight times after a purge; his tongue was moist and coated yellow; there was jaundice, and the blood showed spirilla; the colour of his face was purple. On the 5th day his temperature was 36·5°, and his pulse 72. He was semi-comatose, in a typhoid state, and very weak; jaundice continued, and the liver and spleen were very tender and large, the tongue was dry and coated, and he had slight cough, but his lungs were resonant, except at the bases behind. On the 6th day he was dying. His temperature was 38°, and his pulse was

108, very feeble, and could hardly be counted. His respiration was 36, very laboured, and he had much cough, with mucus in the trachea ; the lungs were quite resonant in front ; his tongue was dry, glazed and red. The abdomen was tender everywhere, and jaundice was still very deep ; the odour of the breath and skin was almost as bad as in typhus. No eruption was visible except some tiny dark petechiæ on the chest. *Post mortem* (24 hours later) :—The body was emaciated ; the right lung showed recent red congestion. The left lung was very congested, purple and oedematous ; it felt solid, but floated well. The liver was large, yellowish-brown and soft. The spleen was double the normal size, bright red and pulpy. The kidneys showed recent congestion. The intestines were fairly normal. The blood was normal in appearance, not liquid, and not dark-coloured.

Four men died during the first intermission on the 10th, 11th, and 15th days, and the others on various days between the 28th and 48th.

In an unknown epidemic, it should be assumed, I think, that if the death-rate from fever keeps up above 5 or 6 per cent., typhus is probably present.

COMPLICATIONS AND SEQUELÆ.

Jaundice, diarrhoea, and dysentery I have already mentioned. Bronchitis and true pneumonia are sometimes seen. Epistaxis is the only form of haemorrhage that I have observed. Marked anaemia is very common during and after convalescence, and some of the most feeble show oedema of the feet and legs. Iritis, ulceration of the cornea, herpes of the lips, and boils are among the rare complications. Parotid buboes I have only seen in two cases, one of which died ; they appeared during the second intermission, after the relapse. Very little pus escaped when they were incised, but there was great tendency to burrow towards the hyoid bone and elsewhere, and in the fatal case the anterior mastoid process of the temporal bone was laid bare.

PATHOLOGY AND MORBID ANATOMY.

There is a great increase of leucocytes in the blood in many cases, which accounts for the anaemia during convalescence

which I have mentioned. But the important need for blood-examination is, of course, the presence of the spirillum, which can be found easily with a power of 500 diameters by anyone accustomed to microscope-work. When blood is taken from the washed finger of a suspected case, and no spirilla are found in two or three specimens, it may be assumed, either that the case is not one of relapsing fever or that it is being searched for too late ; for it must not be forgotten that the spirilla disappear entirely from the blood from 12 to 24 hours before the temperature falls at the crisis. The spirillum must be looked for in fresh blood, but will be found more easily if a stain is used, for it shows readily with gentian violet, Bismarck brown, or fuchsin. Gunther's method is to be recommended for students. I have never seen any swarms or aggregated masses of spirilla, the filaments being always unattached, in motion, and never more than four or five in the field at once. The movements of the spirilla are partly rotatory, but chiefly those of lateral progression, and they vary from a slight vibratory thrill to very rapid motion, making it difficult to keep them under the microscope ; they often attach themselves, as if in sport, to the blood-cells, and pull them temporarily out of shape. Inoculation experiments on monkeys produce symptoms which correspond to the disease in man, with an incubation of about three days and no relapse, ending in recovery ; the attack does not confer immunity upon them.

Condensed Post-mortem Notes.—Discoloration of the skin, but not so marked as in typhus ; healthy muscles and heart and red clotted blood ; congestion of kidneys and, to a less extent, of other organs. Usually there is no eruption ; and when jaundice has been present there is a deep-yellow tint of skin, bones, and sometimes intestines, while the bile-ducts are perfectly pervious, and bile is found in the duodenum. The spleen is generally twice as large as in health, but in 4 of my 17 cases it was of normal size and weight. The liver is slightly enlarged, if the patient dies early in the attack. If there has been much diarrhoea, there will be emaciation, and the intestines will be found congested (they often contain round worms), while the solitary glands and Peyer's patches appear normal. In one case, 16 hours after death, there was evidence of intense peritonitis, and the liver was of a yellowish-brown

colour and contained air, like a sponge. The necropsies were performed at periods varying from 3 to 24 hours after death.

DIAGNOSIS.

Yellow fever is unknown in Egypt, and enteric fever has so far only been seen among Egyptians in rare sporadic instances, and never as an epidemic. The microscopical examination of the blood will establish the diagnosis beyond doubt, especially if the observer looks for the spirillum, and also for malarial haematozoa.

It is chiefly by the presence or absence of spirilla that relapsing fever can be diagnosed from Griesinger's "biliary typhoid," which was so long believed to be a variety of relapsing fever. But the geographical distribution must not be forgotten ; and the early cases of an epidemic occurring in the neighbourhood of Cairo are more likely to be relapsing fever, while similar cases found in or near Alexandria will probably prove to be Griesinger's disease. Under the heading of Typhus I have given the differential diagnosis of that disease with relapsing fever.¹ The coincidence of these two diseases may assume various forms ; sometimes they occur simultaneously, in sporadic cases or in epidemic outbreaks ; or typhus may greatly predominate ; or, as is more frequently the case, relapsing fever may occur as an epidemic, while typhus appears towards its end ; or, finally, the typhus-epidemic may precede the relapsing cases.

In far-away country villages, where no microscope can be obtained, an unknown fever can often be diagnosed correctly by remembering the critical drop in temperature which takes place in relapsing fever on the 5th, 6th, or 7th day. I have tried unsuccessfully to convey the spirillum from country cases to the town by allowing leeches to bite patients.

PROGNOSIS.

Jaundice is a bad symptom, as I have shown, and petechiae on the skin are a sign of danger. The "typhoid state" is probably dependent on failure of the kidneys to act, and most cases of it die. No patient can be considered safe until he

¹ THE PRACTITIONER, April, 1904, p. 518.

has passed 14 days without diarrhoea or dysentery after the cessation of the fever.

TREATMENT.

The patients should be given as much fresh air as possible, which will be found to lower the death-rate. The drug-treatment can be only symptomatic; salicin or salicylate of soda may be tried for pains in the limbs and headache; constipation will require sulphate of magnesia, and the tongue should be kept clean. Patients should be allowed unlimited water to drink to assuage their thirst, and also to try and ward off uræmic symptoms. Tonics are wanted during convalescence, and patients must be allowed to return slowly to solid food, and should be warned to report the presence of diarrhoea. Attendants on the sick must be protected as far as possible by giving them sleeping-quarters away from their patients, by encouraging them to expose themselves very freely to the fresh air, and by giving them good food, and, if necessary, tonics.

The *prevention* of the disease is similar to that of typhus.

REFERENCES.

- Hippocrates : *De Morbis vulgar.*, Lib. I., pp. 953-956.
 Abd-el-Latif : *Relation de l'Egypte*, Paris, 1810.
Description de l'Egypte, Paris, 1823, 2nd ed., XIII., p. 150.
Mémoires sur l'Egypte, Paris, 1802, II., pp. 326, 376.
 Proust : *Traité d'Hygiène*, Paris, 1881, 2nd ed., p. 797.
 Pruner : *Topographie Médicale du Caire*, Munich, 1847.
 Hartmann : *Skizze der Nilländer*, Berlin, 1865.
 Griesinger : *Maladies Infectieuses*, Paris, 1868.
 Sandwith : "Typhus and Relapsing Fevers in Egypt," *St. Thomas's Hospital Reports*, Vol. XVI.
 Vandyke Carter : *Spirillum Fever in Western India*, London, 1882.
 Hirsch : *Geographical and Historical Pathology*, London, 1883, Vol. I.
 Symmer's translation of Thoinot and Masselin's *Outlines of Bacteriology*, p. 283.
 Christy : "Spirillum Fever (Relapsing or Famine Fever) in India," *Journ. Trop. Med.*, 1902, p. 39.
 Nuttall : "Note on the Transmission of Relapsing Fever by Bed-bugs," *Journ. Trop. Med.*, 1902, p. 65.



DIET IN GOUT.

By ARTHUR P. LUFF, M.D., B.Sc., F.R.C.P. (LOND.).

Physician in Charge of Out-Patients in St. Mary's Hospital.

GOUT is a disease which is due to faulty metabolism, probably both intestinal and hepatic, as the result of which certain poisons (possibly the purins and other bodies, but of which we at present know but very little) are produced and lead to an auto-intoxication, which is an early factor in the development of the gouty condition. This auto-intoxication coincides with or is followed by, in the majority of cases, a deposition of sodium biurate in certain of the joints and tissues, which constitutes the climax of the gouty attack. I cannot but think that with our increasing knowledge and experience of the disease, uric acid and its salts will in all probability have to be relegated to a position of subsidiary importance in the pathogenesis of gout. The joint manifestations are probably dependent upon much more general and much larger conditions than a mere excess of uric acid in the blood. The deposition of sodium biurate is possibly merely the sign of the disease, not the essence of it.

As regards the dieting of gout it must be borne in mind that no routine method can be adopted which is suitable to all cases. The nutritional condition of the patient, his habits, his surroundings, and his mode of life, constitute factors that must necessarily modify the treatment of individual cases ; and with gout, as with so many other diseases, it will be found that each individual case requires separate study and frequently special dieting. Apart from the treatment of an attack of gout, which is a comparatively simple and easy matter, must be considered the treatment of the condition or conditions which led up to the attack. In connection with this point it must be remembered that the gouty individual is one whose general metabolism is unstable, and that this instability may be present in one or more of the great physiological systems—the digestive, the nervous, the circulatory, &c. The question which of these systems is primarily and mainly at fault should always be a

matter of patient investigation, and one must then endeavour to improve the metabolism of that system by suitable treatment.

No hard-and-fast lines as to dietary can be laid down in the treatment of gout. Each individual must be carefully considered as regards his habit of body, his capacity for the digestion of different articles of food, the amount of exercise he is able to take, and the nature of his work. Derangements of the gastro-intestinal tract constitute a most important factor in the development of acute, chronic and irregular gout. It is, therefore, of the utmost importance to secure and maintain a healthy condition of the gastro-intestinal mucous membrane, and a normal daily evacuation, in order to guard against auto-intoxication, which is undoubtedly an early factor in the development of the gouty condition. The individual who is subject to gouty attacks can certainly diminish the number and severity of the attacks, and in many cases can prevent their recurrence, by careful attention to diet, to the quality and the quantity of fluid taken, to exercise, and to a sufficient daily action of the bowels.

In advising as to the diet of any particular gouty individual the personal factor is a most important one to consider, and it is wise to gain some knowledge as to the likes and dislikes of the individual with regard to food. In this connection it is well to remember the saying of Sydenham, that "more importance is to be attached to the desires and feelings of the patient, provided they are not excessive, than to doubtful and fallacious rules of medical art."

It should be well borne in mind that great changes in diet should not be made too abruptly. The researches of Pawlow show that a habit of digesting easily any particular kind of food is acquired by the stomach, which secretes a gastric juice appropriate to it; so that, if the food is suddenly changed, time is required for the digestive organs to accommodate themselves to the altered conditions. If the change is too sweeping and too abrupt, the patient will probably suffer.

It is well known that the excessive consumption of rich nitrogenous food, combined with excesses in wine and malt-liquors, both induces and excites gout. The comparative immunity of females and young people from gout is mainly explained by the absence of such determining causes of the

gouty attack, combined, in the case of young people, with the absence of predisposing cause, and also with the fact that the secreting functions are in full activity. The subjects of gout are generally persons who live well and consume a large amount of animal food. Dr. Budd, speaking from a long and extensive professional connection with a large rural district, states that he never knew an instance of gout occurring in an agricultural labourer.

Gouty people may for the purposes of the consideration of diet be roughly grouped into three classes :—

(1) Those who suffer from more or less frequent attacks of acute gout ; (2) those who have never suffered from an acute attack, but who are constantly subject to some chronic form of regular or irregular gout, especially after slight indiscretion in diet ; and (3) those who are only affected with gouty symptoms (generally of the irregular kind) when they eat or drink certain articles, and who therefore in order to avoid these gouty symptoms have to be especially watchful over their diet. As Mouillot has observed, it will usually be found that patients in classes 2 and 3 are the offspring of those who have suffered from acute gout.

DIGESTIBILITY OF FOOD.

Gout, which is a toxæmia, originating to a great extent in the alimentary tract, derives its toxic products from the improper digestion of food-stuffs. Whatever articles of food can be properly digested by the gouty, are therefore suitable articles for their dietary. The physical condition of an article of food to a very great extent determines its digestibility. By digestibility is meant not necessarily the extent to which it is absorbed into the blood, but the power of disposing of the food by the stomach, without the production of discomfort or pain. The digestibility of the various kinds of fish, and of the flesh of birds and animals, depends on the length of the muscular fibres, and on the amount of fat deposited between the fibres. The shorter the fibres, and the smaller the amount of fat deposited between them, the more digestible will the article of food be. If an article of food tends to be swallowed in a solid lump, such for instance as new bread or new potatoes, so as to prevent the ready permeation of the substance by the

digestive juices, it tends to be indigestible purely by virtue of its physical condition. If such articles were first reduced to minute subdivision by thorough mastication and insalivation, their indigestibility, as far as ordinary individuals are concerned, would disappear.

It is not so much a matter of importance to know whether any particular article of food contains uric acid or its antecedents or not, as it is to know what its properties are as regards digestibility and as regards its influence on the processes which are concerned in the conversion of food-stuffs into body-stuffs. The researches of Pawlow have shown that the food-value of any particular article of diet must depend to a large extent upon the amount of energy necessary for its digestion.

If gouty persons partake of meals of too complex a character, then, owing to the abnormal intestinal and hepatic metabolism of such subjects, excessive production and imperfect elimination of toxic products may result. Although both excessive production and imperfect elimination of these abnormal products of digestion go more or less together, yet it is a matter of fairly frequent observation that some gouty persons seem to be especially the victims of excessive production of toxic products, and others to be mainly affected by defective elimination.

ANIMAL FOOD.

The generally-accepted view that a highly nitrogenous animal diet necessarily produces an excessive amount of uric acid is disproved by the experiments of Bleibtreu and of Hirschfeld. These experiments show that there is an increased elimination of urea to compensate for an excessive intake of nitrogenous food, and that the amount of uric acid remains practically undiminished. Judging by the results of my own experiments, it is highly improbable that any diminution in the alkalinity of the blood, which might be produced by the consumption of an excessive amount of animal food, could in any way affect its solvent powers for uric acid, or accelerate the precipitation of sodium biurate. My own view is that, as regards the production of uric acid from proteid matter, it is of little importance whether the proteid is of animal or vegetable origin. The same harm may result from an excessive

consumption of either form of proteid. But although animal and vegetable proteids may react alike with regard to the production of uric acid, it is now known that the different saline constituents of animal and vegetable foods do materially affect the solubility of sodium biurate and therefore influence its precipitation.

As regards the question of meat, it must be remembered on the one hand that animal foods constitute to the majority of people the most attractive and appetising forms of diet, and are therefore likely to be taken in excess ; hence the necessity for limiting the amount to be taken. But on the other hand it must be borne in mind that it is most desirable to increase the combustion and the oxidative powers within the tissues. In my opinion it is absolutely erroneous to exclude from the dietary of the gouty such articles as meat, fish, and tea, because they are assumed to contain uric acid. I have yet to learn that any uric acid is present in these articles of diet, since the so-called estimations of uric acid in them are not, as I have elsewhere pointed out, estimations of uric acid at all. Moreover, the deduction is an erroneous one that because uric acid is a nitrogenous body, it must therefore be directly derived from nitrogenous constituents of the food, the consumption of which must consequently be avoided. Even if uric acid were present in the articles of food referred to, it would not alter my opinion as to their suitability, considering that they have stood the test of so prolonged a trial. Yet there are some who do not hesitate to call these articles of food, which are so extensively consumed, poisons, mainly, as far as I can gather, because these foods do not happen to agree with themselves. It is true that there are a few persons whom, without any intention of being offensive, I should describe as "physiological degenerates," who find that such articles of food do not agree with them ; but it is illogical to argue from such a premiss that therefore these articles are unsuited to the great majority whose digestive functions are more happily regulated. The fact that many races in the past have been largely carnivorous as regards their diet, and that some are so even at the present time (Esquimaux, Andamanese, &c.) shows that the assumption that animal foods are necessarily poisonous to man is an entirely erroneous one. No class of food-stuff gives so great an

amount of energy and produces so much heat as animal food, and no class is more easily digested by the majority of gouty people.

On the whole it may be stated that animal food, such as fish, chicken, game and meat, is best suited to the majority of gouty cases, whilst foods of the farinaceous class are most likely to disagree. White meats, such as chicken and fish, are more digestible than red meats. The quantity of meat, and especially of red meat, must be restricted in those cases in which the kidneys are imperfectly performing their eliminating functions, as evidenced by a pale urine, of low specific gravity, and deficient in urea and purin-bases.

VEGETABLE FOOD.

A fair proportion of vegetable food should be taken with two meals each day. The choice of vegetables will depend upon the digestive capacity of the patient ; but, excepting the potato, as a rule those vegetables that grow above ground are preferable to root-vegetables. Whereas the mineral constituents of meat exercise a marked effect in diminishing the solubility of a gouty deposit, the mineral constituents of most vegetables exercise a marked power in increasing its solubility. The vegetables, the mineral constituents of which I find are most efficacious in this respect, are spinach, Brussels sprouts, potatoes, cabbage, and French beans. At the same time, it must be borne in mind that with certain patients some of these vegetables may tend to produce some form of dyspepsia ; and I cannot too strongly urge that in the dieting of the gouty no hard-and-fast rules can be laid down, but the idiosyncrasy of each patient to various articles of diet must be made the subject of careful observation and study. Due consideration should also be given to the patient's experience of what articles of diet disagree and agree with him.

SIMPLICITY OF MEALS.

The diet of gouty patients should be simple, that is, the meals should not be made up of too many articles. Simplicity of food means facility of digestion. Moderation in both eating and drinking is perhaps one of the most essential points to

insist on in the dietary of the gouty. Certainly meat, even red meat, should not be excluded from the diet. No class of food-stuff is so productive of energy as animal food ; and as most cases of chronic gout are suffering from lowered vitality and want of tone, animal food, at all events in moderate quantity, is distinctly indicated. My experience supports the truth of this view, as I advise, in the great majority of cases of chronic gout, the taking of at least one meat-meal a day. The exclusion of any article of diet or of any class of food, without taking into account the surroundings of the case and the peculiarities of the individual, is unscientific. Those articles of diet that are known in the individual to favour intestinal fermentation and putrefaction should certainly be avoided, and it may be taken, I think, as a general rule, that a sense of discomfort after a meal indicates that some article or articles of food have been taken which are not beneficial to the individual in his present condition.

If the gouty symptoms are due to over-production of toxic material from faulty intestinal and hepatic metabolism, and if at the same time the kidneys are sound, then a diet which mainly consists of animal food is indicated, and in extreme cases of this class even the so-called "Salisbury diet" may be useful. If, on the other hand, the gouty symptoms are due to defective elimination on account of diseased kidneys, then a diet which is more vegetarian will be best. The value of the so-called "Salisbury diet" consists in the small amount of energy necessary for the digestion of so simple a diet, and in the fact that it contains little which can set up intestinal fermentation or putrefaction. On the other hand, a strictly vegetarian diet requires more digestive energy than a purely animal one, and a much larger quantity of vegetable food must be taken to produce an equal nutritive effect.

If, during the treatment of gout, an attack of gouty dyspepsia should at any time intervene, then a milk-diet should be employed until the dyspeptic symptoms have abated.

THE "SALISBURY DIET."

As previously stated, as little complexity as is possible in the meals is the main desideratum in the dietary of the gouty,

and in a few intractable cases of chronic gout it may even become necessary to reduce the dietary for a time to the simplest possible condition, namely, to two articles of food—lean meat and water. There are a few cases of *chronic* gout which undoubtedly improve, and even recover, on an exclusive diet of red meat and hot water. These are generally cases of chronic gouty arthritis which have failed to yield to the ordinary methods of treatment, and which are accompanied by dyspepsia, flatulence, acid eructations, pyrosis, and offensive stools. I have successfully treated a few such carefully-selected cases of chronic gout by the employment of this, the so-called "Salisbury" treatment. It is essential, before placing a patient on such diet, that the urine should be carefully examined, as any advanced condition of kidney-disease contra-indicates the employment of such a dietary. If the evidence of kidney-derangement is only slight, the adoption of the dietary is not contra-indicated; but the urine must be carefully examined every two or three days, as any considerable increase in the albuminuria would at once be an indication for the discontinuance of this special diet. Gouty patients suffering from organic heart-disease with any failure of compensation should never be placed on this dietary. The dietary consists in the patient drinking from three to five pints of hot water daily, the water being taken from one hour to one hour and a half before each meal, and half an hour before retiring to rest, and from two to four pounds of beefsteak daily. The meat should be freed from fat, gristle, and connective tissue, thoroughly minced, mixed with a little water, and then warmed through with gentle heat until it becomes brown in colour. A little salt and pepper may be added, and the meat eaten in this form or made up into cakes and cooked on the grill. Later on in the treatment, part of the steak may be taken grilled, or a grilled lean mutton-chop may be substituted for one of the daily meals. The course of treatment should last for from four to twelve weeks, after which a gradual return to ordinary diet should be made.

STARCHY AND SACCHARINE FOODS.

Starchy articles of food should be especially limited in amount in those gouty individuals who are subject to gastric hyperacidity (*hyperchlorhydria*). This condition is not due to

gastric fermentation, but to an excessive secretion of hydrochloric acid by the gastric glands, and is a common cause of dyspepsia, and ultimately of gastric dilatation. It is due to an acid dyscrasia, as the result of which the secretion of gastric juice does not cease with the digestion of the proteid materials of the food, but continues after they have been disposed of. The result is that a considerable portion of the starchy materials is kept back in the stomach, and this retained starch keeps up the gastric secretion without at the same time giving it any work to do.

When intestinal fermentation and putrefaction occur, as evidenced by a sense of discomfort after a meal, I attach great importance to the reduction of the starchy articles of food, but not to the total exclusion of, what I believe to be comparatively harmless, the potato. It is remarkable how frequently one hears from gouty patients the emphatic statement, "I never eat potatoes." I must confess that I do not know of any good and sufficient reason for this wholesale condemnation of this common article of diet. Undoubtedly amongst those gouty patients who suffer from an inability to digest starchy articles of diet—in other words, who suffer from amylaceous dyspepsia—a reduction for the time in the amount of starchy foods taken, including potatoes, is desirable ; but the recognition of the existence of amylaceous dyspepsia is a fairly easy matter, and when present it can be suitably treated. Certainly those who are gouty and fat should be very sparing in the use of potatoes, as of other carbohydrate forms of food. I wish, however, to protest against the too general exclusion from the food of the gouty of so common and useful an article of diet as the potato. The best form in which potatoes can be taken by the gouty is the crisp form, which requires thorough mastication and insalivation. Boiled new potatoes should be absolutely interdicted to the gouty.

Equally wrong, in my opinion, is the total exclusion of sugar from the dietary of all gouty individuals. Undoubtedly in certain individuals sugar may do harm, as in the cases of gouty persons who are fat, or who suffer from glycosuria, or who are prone to attacks of eczema ; and in such it should be cut off; but that is no reason for the exclusion of it from the dietary of all gouty patients. I know of many gouty

individuals who take sugar with absolute impunity. Some gouty subjects undoubtedly digest very badly all starchy articles of diet, and in such fats may well take the place of starches. Fat bacon, properly cooked, is generally well digested by gouty individuals.

Subjects who are both gouty and fat should avoid sugar, but undoubtedly sugar may be taken with advantage by those who are gouty and thin, and such subjects may also take in moderation marmalade and wholesome jams. Bread may advantageously be given as crisp toast, or in the form of rusks, or in the "Zwieback" or twice-baked form, as in these conditions it requires thorough mastication and insalivation.

FRUITS.

Any fruit which from experience is known to agree with the individual may be taken by gouty subjects. Apples and oranges generally agree best. Uncooked fruit should never be taken at a meat meal, and is best consumed fasting fairly early in the day, as between breakfast and lunch. It should always be thoroughly masticated. Strawberries are frequently avoided by the gouty owing to their producing in some subjects a certain amount of temporary irritation of the skin, but such irritation generally passes off in a short time. In a few subjects strawberries produce eczema or some other rash, but such cases merely represent idiosyncrasy to the special fruit, and necessarily such individuals, whether gouty or not, should not eat strawberries. I am, however, strongly of opinion that the indiscriminate banishment of strawberries from the dietary of the gouty is unnecessary. Except in those cases in which there is an idiosyncrasy to their use they constitute a good article of diet for the gouty, on account of their delicious flavour, their antiscorbutic properties, and their richness in potassium-salts. It is, however, very necessary that they should be ripe and fresh. They are soon prone to decomposition, and in such a state they aid in the development of those intestinal fermentations which are so inimical to the gouty.

BEVERAGES.

It is my custom to question closely each gouty patient that I see, not only as to the nature of the beverages taken, but also

as to their amount ; and my general experience is that the great majority of people suffering from gout take an insufficient quantity of water to drink. Consequently there is an insufficient flushing of the liver, kidneys, and other organs and tissues, and therefore imperfect removal of waste and toxic products. More especially does one find this insufficient consumption of fluid among female patients, in many cases due to the absurd and erroneous belief that a diminution in the amount of fluid taken tends to keep down the body-weight and to prevent the occurrence of obesity. Taking from my case-books ten consecutive cases of gout occurring in ladies whom I carefully questioned as to the amount of fluid consumed per diem, I find that amongst these ten the amount averaged only 26 fluid ounces ; this included all fluid, whether taken as water, tea, coffee, soup, wine, ale, &c. The amount is obviously insufficient for the proper flushing of the system. For the treatment, as well as for the prevention, of the gouty condition the free consumption of water apart from meals is most desirable.

Only a small quantity of fluid should be taken during meals, but during the day from two to three pints of some pure water should be taken. In many cases the ordinary tap-water answers perfectly well ; but if it should happen to be too hard a water or of doubtful purity, then some simple water such as still Salutaris, Contrexéville, &c., may be taken.

ALCOHOLIC DRINKS.

Stated as a general principle, a person who is subject to gout is better without alcohol in any form. There are, however, some who require a little alcohol, either to aid digestion or to enable them to get through their work ; and here I am entirely in accord with the advice given by Goodhart, that, if a man requires any stimulant at all, it is a matter he must decide by experiment for himself, for no medical man can tell him. If alcohol is necessary or desirable, the form in which it is to be taken is frequently a matter which the patient can decide better than the medical man ; but I would insist upon the importance of definitely limiting the amount to be taken, and of restricting its consumption absolutely to meals. Some patients find that a little whiskey or brandy suits them best ; others find a light

still Moselle preferable; but a few, but in my opinion only a very limited number, find a light claret agrees best with them. Champagne is a wine which is seldom suited to the gouty, especially if taken daily. In elderly people or in the feeble, a moderate amount of pure whiskey undoubtedly does good; but the indiscriminate ordering of whiskey to gouty subjects is, I am sure, wrong.

It is well known that certain alcoholic drinks injuriously affect the gouty process, whilst others exert a less injurious influence. Alcoholic drinks which have been obtained by fermentation, but which have not been submitted to distillation, such as wines and beers, appear to exercise a more harmful influence than if the same amount of alcohol be consumed in form of one of the distilled spirits, such as whiskey, brandy, &c. Garrod considers that the reason for the prevalence of gout in the south of England and its rarity in Scotland is chiefly to be found in the difference between the beverages drunk in the two countries.

Distilled spirits contain little or no acid, whilst wines and beers are distinctly acid; and to the acids contained in these drinks many physicians have attributed, and still do attribute, their gout-producing properties. The acids present are tartaric, succinic, malic, acetic, formic, propionic, butyric and *cœnanthic*. The acidity of wines is mainly due to tartaric, malic, and succinic acids. The amount of free acid in sound wine, reckoned as tartaric acid, varies between 0·3 and 0·7 per cent. I found the acidity of some 1847 Port, reckoned as tartaric acid, to be 0·6 per cent. Cider owes its acidity mainly to malic acid. Its total acidity is usually 0·1 per cent. If we arrange the various wines in (*a*) their order of acidity and (*b*) the order of their gout-inducing power, we find that the most acid wines are not those which most predispose to gout. The arrangement of wines and beers in the order of acidity, beginning with the most acid, is that given by Dr. Bence Jones, while the arrangement in order of their gout-inducing power is that given by Sir Alfred Garrod:—

WINES AND BEERS ARRANGED IN ORDER OF ACIDITY AND
GOUT-INDUCING POWER.

(a) Acidity (beginning with the most acid).	(b) Gout-inducing power (beginning with the most powerful).
Moselle.	Port.
Rhine wines.	Sherry.
Burgundy.	Other stronger wines.
Madeira.	Champagne.
Claret.	Stout and porter.
Champagne.	Strong ales.
Port.	Claret.
Sherry.	Hock.
Malt liquors.	Moselle.
	Weaker kinds of ales.

Hock, Moselle and the weaker kinds of ales have comparatively little gout-inducing power.

The acidity of alcoholic liquors cannot have much influence in determining an attack of gout, as port, sherry and malt-liquors, which are the most powerful predisposing agents, are amongst the least acid, whilst the more acid wines are comparatively harmless in this respect; moreover, it must be remembered that the organic acids and their salts contained in wines are converted in the body into alkaline compounds, and are excreted in the urine as such.

The question is, To what constituent or constituents of wines and beers are their gout-inducing properties due? They are not due to the alcohol alone, for in countries such as Scotland, Norway, Sweden and Poland, where distilled spirits are, or were, freely consumed, gout is almost unknown. Moreover, several experiments that I have made indicate that alcohol, in such quantities as are ever likely to be present in the blood, has no effect either upon the conversion of sodium quadriurate into biurate or on the solubility of the latter. The gout-inducing properties are most probably not due to the acids of the wines and beers, for the reasons which have

already been given. It is also very doubtful whether the sugar present in wines is *per se* harmful ; but as a rule the sweet wines are fortified wines, while the natural wines are generally dry. It is very probable that the sweet fortified wines are prone to produce fermentative changes in the gastro-intestinal tract, and are on that account harmful to the gouty.

The gout-inducing properties are certainly not directly due to the cenanthic ether and other ethereal salts of wines exerting any effect either on the rate of decomposition of the sodium quadriurate or on the solubility of the biurate. To demonstrate these points, I have extracted from old port wines the ethereal salts to which the bouquet of the wines is due, and have experimented with these ethereal compounds on the quadriurates and biurates. Using quantities far in excess of those likely to be present in the blood after the moderate, or even immoderate, consumption of such wine, I find that none of these volatile constituents exercise the slightest effect either in hastening the decomposition of the sodium quadriurate or in diminishing the solubility or hastening the precipitation of sodium biurate. As to the *modus operandi* of certain wines, such as port, &c., in hastening an attack of gout, I incline to the opinion that the influence of wines on the development of gout is in great part due to the effect they exercise in producing fermentative changes in the gastro-intestinal tract, and in also injuriously affecting hepatic metabolism. At the same time, it must be remembered that those accustomed to drink wine are also able to indulge in other luxuries of the table which greatly favour the development of gout.

Port is a wine which is especially unsuited to the majority of gouty subjects. The gout-inducing properties of the wine are, I believe, mainly dependent upon the ethereal compounds which give the aroma or bouquet to the wine, although these bodies do not act directly on either the quadriurate or biurate of sodium. If this view is correct it would explain the well-known fact that old and matured ports are much more provocative of gout than comparatively new ports taken direct from the wood. The development of the ethereal compounds in the wine extends over many years, and especially progresses after the wine is laid by in bottles. In a few cases of asthenic gout, especially in old people, a moderate amount

of comparatively new port taken direct from the wood undoubtedly does good.

In my opinion the wines which are least injurious as a rule to gouty subjects to whom it is found necessary to order a small amount of wine are the light still white wines, such as Moselle, certain French wines, certain Austrian wines, hock, and a few of the lighter Australian and Californian wines. These last, owing to their greater alcoholic strength, should be taken diluted with water or some mineral water.

Gouty subjects suffering from glycosuria or diabetes should entirely abstain from alcoholic drinks, unless marked debility and loss of appetite necessitates the restricted administration of them. Gouty persons subject to attacks of eczema are also much better without alcohol in any form.

"Rough" cider, that is the completely fermented apple-juice, taken in moderation, agrees well with most gouty subjects. It contains but a small percentage of alcohol, is free from sugar, and its acidity is chiefly due to malic acid, which passes into the circulation in the form of alkaline malates, which in their turn are converted in the kidneys into alkaline carbonates and excreted as such, thereby increasing the elimination of urates. The bottled or "champagne" cider, which is imperfectly fermented, should never be used by gouty individuals, owing to its undoubted liability to set up gastro-intestinal fermentations. Dry or "rough" cider mixed with an equal quantity of an aërated water is an excellent beverage for the gouty. Dry perry is also a suitable drink for the subjects of gout.

"Imperial drink" constitutes an excellent febrile drink for the gouty, and in cases of chronic gout may advantageously be taken when the urine is high-coloured and when it deposits amorphous urates on cooling. It is made by dissolving a tea-spoonful of powdered cream of tartar (potassium bitartrate) in an imperial pint of water or barley-water, and then sweetening to taste with loaf-sugar which has been flavoured by rubbing against the rind of a fresh lemon. In place of the sugar, an ounce and a half of syrup of lemon may be added to the pint of liquid. In cases of obese individuals the drink should be sweetened with saccharin or saxon in place of the sugar.

MINERAL WATERS.

The value of a given mineral water in the treatment of gout depends greatly on the main object with which it is taken. For instance, it may be taken to remove gouty deposits, or to stimulate the action of a sluggish liver and to relieve portal congestion, or for the treatment of gouty dyspepsia, or to relieve the bowels in cases of torpor and gastro-intestinal catarrh, or to act on the kidneys, or to relieve gouty affections of the skin. Now it is manifest that any one mineral water is not likely to produce all these effects, and it is also obviously conceivable that a mineral water which might be most useful to effect one of these purposes, might prove most injurious if employed to effect another.

The use of a mineral water, so far as its employment with the object of removing gouty deposits is concerned, lies solely in its watery constituent, and does not in any way depend on the mineral constituent dissolved in it. As a matter of fact the salts dissolved in some of the natural mineral waters are directly harmful in gout, both by encouraging deposition of the sodium biurate and by checking solution of the gouty deposits. The flushing of the system of a gouty patient with abundant quantities of water is undoubtedly beneficial, since it dilutes the blood for the time, and so tends to prevent uratic precipitation, and at the same time promotes diuresis and encourages elimination. It should, however, be borne in mind that owing to the undoubted fact that sodium-salts are directly detrimental to the removal of gouty deposits, those waters should be avoided which owe their activity to those salts, *when the removal of the deposits is the main object to be attained*. The waters which contain no sodium-salts, or traces only, are those suitable for such cases. I wish it to be clearly understood that I am by no means condemning the very proper uses to which mineral waters containing sodium-salts can be put for the treatment of many gouty affections of the viscera and other structures, but I wish to emphasise the point that, when the system is flushed with a mineral water with the object of dissolving and removing gouty deposits, then it is undoubtedly advisable to select a water as free as possible from sodium-salts. On the other hand, in cases of sluggish action of the liver, of gastro-intestinal

catarrh and torpor, of gouty dyspepsia, and of other forms of irregular gout where there are no appreciable uratic deposits in the joints, mineral waters containing sodium-salts are undoubtedly beneficial, owing to the action of those salts as hepatic and gastro-intestinal stimulants. The alkaline waters containing sodium bicarbonate such as those of Vichy, Neuenahr, and Fachingen are especially useful in gouty glycosuria, owing to the stimulating effect of the sodium-salts on the hepatic functions.

ARTICLES OF DIET THAT SHOULD BE AVOIDED BY THE GOUTY.

Rich meat-soups :—Ox-tail, turtle, mock turtle, kidney, mulligatawny, hare, giblet..

Salmon, mackerel, eels, lobster, crab, mussel, salted fish, smoked fish, preserved fish, tinned fish.

Duck, goose, pigeon, high game.

Meats cooked a second time :—Hare, venison, pork, lean ham, sweetbreads, liver, kidney, salted, corned or cured meats, pickled meats, preserved and potted meats, sausages ; all articles of food pickled in vinegar ; all highly-seasoned dishes and rich sauces.

Tomatoes, beet-root, cucumber, rhubarb, mushrooms, truffles.

Rich pastry, rich sweets, new bread, cakes, nuts, dried fruits, ices, ice-cream.

DIET IN ACUTE GOUT.

During an attack of acute gout a diet must be given which shall tend to check the abnormal metabolism of the gastro-intestinal tract and of the liver ; which shall be non-irritating to the kidneys ; and which shall be one that diminishes as far as possible the production of the purin-bodies. For the first day or two of an acute attack the patient should be restricted to a milk-diet, which may consist of milk, bread-and-milk, and tea made with boiling milk instead of with water. Weak tea with cold toast thinly buttered may also be taken. The free drinking of hot or cold water, of Salutaris water, or of some mineral water free from sodium-salts should be encouraged. The milk-diet should be continued until the

acute inflammation is subsiding, which stage is indicated by the lessening of the pain, and by the pitting on pressure of the affected parts. No alcohol in any form should be given during this stage, unless there are strong reasons for its administration, such as a weak action of the heart and a feeble, irregular pulse, when a little well-matured whiskey or brandy, diluted with Salutaris water, will prove the best form of alcohol. Beef-tea and any of the meat-extracts or essences should be avoided at all times by gouty patients, owing to the tendency they have to irritate the kidneys, and to introduce into the circulation waste nitrogenous bodies. With the subsidence of the acute attack the patient may return to a more liberal diet, but care should be taken to avoid anything indigestible.

DIET IN CHRONIC GOUT AND FOR GOUTY SUBJECTS.

The following plan gives an indication of the diet to be recommended to gouty subjects :—

Morning.—Half a pint to a pint of hot water, flavoured with a slice of lemon-peel, should be slowly sipped immediately on rising.

Breakfast.—A selection may be made from the following articles of diet, according to the taste of the patient :—Porridge and milk, whiting, sole, or plaice, fat bacon, eggs cooked in various ways, dry toast or "Zwieback bread" thinly buttered, and tea infused for three minutes and then strained from the leaves. Fat bacon is digestible when grilled, but less so when boiled. Eggs should not be taken hard-boiled.

Lunch and Dinner.—Soups suitable for the gouty are vegetable *purées*, and soups made by boiling beef- or mutton-bones with vegetables, and subsequently removing the fat which separates on cooling. These soups should not be thickened with farinaceous substances.

The varieties of fish most suitable to the gouty are whiting, sole, turbot, plaice, smelt, flounder, grey mullet, and fresh haddock.

The birds that are admissible as articles of diet are chicken, pheasant, turkey, and game (not high).

Butcher's meat, mutton, lamb, and beef should be taken at only one meal in the day, and then in moderate quantity.

Two vegetables may be taken at both lunch and dinner. Any of the ordinary vegetables may be taken, except those previously mentioned as best avoided ; but those that I consider most likely to prove beneficial to gouty subjects are spinach, Brussels sprouts, French beans, winter cabbage, Savoy cabbage, turnip-tops, turnips, and celery. Potatoes may also be taken in moderate quantities. Stewed fruits, or baked apples or pears, may be taken every day at one meal.

Green vegetables as salads may be taken, provided oily dressings are avoided. A simple savoury may, if desired, be taken at the end of dinner, or a small quantity of cheese, if well masticated, and if free from the *penicillium* fungus or mould.

Night.—Half a pint to a pint of hot water, flavoured with a slice of lemon-peel, should be slowly sipped before retiring to bed.

With regard to persons who are disposed to gout, but are not actually suffering from it, the usual mixed diet may be taken, but they should limit the starchy articles of food, and should avoid all rich sweets, rice, tapioca, and sago. Thin and ill-nourished subjects require modifications in their diet as compared with people who are stout, while those who take plenty of exercise can take food forbidden to the indolent.

Individuals who especially benefit by a reduction of diet, both as regards quantity and quality, are those overfed people who are past middle life.



OLD AGE.¹

By GUTHRIE RANKIN, M.D. (GLAS.), F.R.C.P. (EDIN.), M.R.C.P. (LOND.).

Physician to the "Dreadnought" Hospital; Senior Assistant Physician to the Royal Waterloo Hospital, &c.

THE advent of old age is one of the most important epochs in human destiny. It is not ushered in by any serious or sudden disturbance of the economy, but creeps on so gradually that it is scarce discovered until it has established its sway over our tissues. Neither does it choose any fixed limit of time for the inauguration of its rule; it is the Nemesis of existence, ever ready to exact the penalty of weakened vitality whenever and however brought about. "Development and life," says Huxley, "are, strictly speaking, one thing; though we are accustomed to limit the former to the progressive half of life, and to speak of the retrogressive half as decay, considering an imaginary resting point between the two as the adult or perfect state." Our vital processes from the cradle to the grave are dependent upon tissue-changes, some of which are initial and others terminal in character. The arterial system leads the van in the development of the body, and also first succumbs to the influence of decay. In early life the body grows because the calibre of the arteries is great in comparison to the size of the heart, and permits of the tissues being flooded with a large amount of nutritive plasma. There is then a rapid pulse-rate and a low blood-pressure. But as growth proceeds, the arteries do not increase in amplitude in proportion either to the greater strength of the heart or to the increasing volume of the tissues. The result is a slowing of the pulse-rate and a rise in the blood-pressure as youth merges into complete development. In process of time, the arterial coats undergo a gradual change of structure, whereby their original elasticity becomes lessened and they become more rigid. In consequence, they yield more slowly to the blood-waves and do not recover so completely; their lumen therefore becomes increased. This

¹ A paper read at Medical Graduates' College and Polyclinic.

lowers again the blood-pressure, and favours the shrinkage of many capillaries for which there is no longer an active need on account of the cessation of growth. The capillary withering compensates the permanent dilatation of the inelastic arteries, and the blood-pressure is restored to its normal level. Later on, when defective metabolism and imperfect assimilation have led to a more extensive development of capillary destruction, the tension becomes abnormally high, and marks the first stage of what may truly be called senile degeneration. Decay is thus the necessary, normal, and final stage of development. It comes within our everyday experience that certain persons look much older than the measure of their years would lead us to expect, a fact which bears testimony to the readiness with which senile changes establish themselves in many whose tissues, according to Nature's normal plan, ought still to be robust with health and strength.

History and statistics have taught us to recognise that among the multitudes of men only isolated exceptions attain great ages, and that comparatively few even reach the traditional limit of three score years and ten.

The inborn love of life makes mankind resent the unwelcome testimony of the senses that the period has been reached when the ravages of time have begun to tell their story and to cast their prophetic shadow on the final ringing-down of the curtain. A pitiful vanity tempts many persons to resort to artificial methods for the preservation of an apparent youthfulness that is for ever gone, and by sartorial and other embellishments to deceive themselves, in their attempts to deceive their neighbours, that they have discovered an elixir capable of projecting juvenescence even into the days when, had they but ears willing to hear, the sound of the sickle might well warn them of the approach of the reaper. And though such practices are, in great measure, a concession to the demands of society, they constitute also objective evidence of the inherent desire, not for a continuance of life only, but for its continuance at its heyday when the spirits are buoyant and the body active, when shine predominates over shadow, when the burden of worldly care is still easy to carry. Perhaps it is Utopian to hope for a restoration of the patriarchal ages; but it may not be unprofitable to consider what are the earliest

phenomena by which the inexorable tendency of Nature to terminate individual life may be recognised, and what are the best means at our present command to enable a larger proportion of humanity more nearly to attain the Ultima Thule of existence, which, according to Beneke, is from ninety to one hundred years.

It is unfortunately too true that—

“Men deal with life as children with their play,
Who first misuse, then cast their toys away.”

Ignorance may be pleaded as some palliation for the recklessness with which the citadel of life is besieged by practices of physical and mental excess, carried on regardless of the limitations of tissue-endurance; but, in the interests of national as well as individual health, it becomes a matter of daily-increasing importance that degenerative changes should be recognised at their earliest onset, and that the gospel of prevention rather than that of cure should be more loudly preached.

It has been truly said that “the blood is the life,” and, since any interference with the adequate distribution of the former must *pari passu* impair the integrity of the latter, it follows that for the preservation of healthy tissues the first essential must be the possession of competent blood-vessels. The tissue-changes which we are accustomed to associate with senile developments are accompanied, and are probably always preceded, by abnormal conditions of the arteries. When it is remembered how closely these blood-vessels are physiologically related to every cell of the body, and how absolutely each tissue depends for its healthful activity upon the nutritive supplies they bring to it, there can be no difficulty in understanding how the inflammatory and degenerative disorders to which they are so liable possess far more than local importance, or how their pathological relationships extend widely beyond the limits of the vessels themselves. Arterial disease is closely related to every morbid process of a degenerative type, so that to a large majority of men death comes primarily or secondarily through this portal. Longevity becomes indeed a vascular question, which is well expressed in the axiom that “a man is only as old as his arteries.”

The conception of arterio-sclerosis as an independent

general affection of the vascular system, which was first formulated by Gull and Sutton, may be accepted as another way of stating that the arterial system is susceptible, as a whole, to the influence of wear and tear, whatever be its source. When once the process has begun, the immediate cause very often determines the situation of local advancement. The poison of gout induces changes in the walls of the small arteries, particularly in those distributed to the kidneys; syphilis has a recognised predilection for the vessels at the base of the brain; mechanical strain produces its evil effects on the aorta and large vessels; and tubercle invades the pulmonary branches, in whose neighbourhood it finds its most congenial field of activity. The primary effect of irritation of the arterial walls arising from an altered condition of the blood is to produce spasm with a consequent increase of blood-tension, and the most important ulterior possibilities are thrombosis or embolism.

Without entering into any detailed description of the anatomy of the blood-vessels, the following facts may be recalled. The capillaries consist of a single layer of flattened, nucleated endothelial cells, held together by a cement-substance, which under the influence of increased pressure yields and makes an escape of blood possible. The arteries may be roughly divided into large, medium, and small, and of the three coats which they all possess, it is important to remember that the tunica intima consists of a layer of endothelial cells similar to those which form the capillaries, outside of which is a sub-endothelial connective-tissue layer and a homogeneous elastic layer; that the tunica media is composed of non-striped muscular fibres and elastic tissue arranged in alternate strata transversely to the axis of the vessel, the elastic element predominating in the larger and the muscular in the smaller vessels; and that the tunica adventitia consists of fibrous and connective tissue with interspersed longitudinal elastic fibres, and contains blood-vessels, lymphatics, and nerves for the vital requirements of the vessel-walls.

In the aorta the adventitia is comparatively thin, and the media contains relatively little muscular structure; while in the encephalon, the arterioles have a remarkably thin adventitia, and are surrounded by a perivascular lymphatic sheath which

contains a transparent fluid. These important departures from the general anatomical type are of great practical importance : the enormous aortic elasticity enables it to withstand the constant impact of the blood-waves as they are ejected from the left ventricle, and so provides against the risk of aneurysmal dilatation ; and the lymphatic envelopment of the cerebral vessels secures equalisation of pressure, and increases the comparatively feeble support of the soft cerebral substance.

There are many extraneous causes of arterial degeneration, but those upon which special stress may be properly laid in connection with ultimate atheromatous changes are syphilis, alcohol, gout, and excessive physical strain. Another ætiological factor is old age, but the changes are then a normal event in tissues that are worn out from sheer failure of vitality throughout the organism as a whole. Apart from these causes, physiological integrity may be endangered by an inherited weakness of vascular tissue. Throughout several generations there is sometimes found such a tendency to early degeneration that the vessels at 40 are as tortuous and sclerosed as they should be, under average circumstances, only at 70 or 80. In all chronic forms of arteritis, the earliest symptoms from which a hint may be taken that there are dangers ahead, is continuous high pressure, which is manifest in the pulse by the condition known as plus-tension. According to Huchard, increased arterial pressure is, in the early stages, due to irritative spasm only ; but Von Basch looks upon it as the expression of a vascular change already established. Whichever view be correct, it still remains true that in it we have the earliest possible evidence of departure from the normal. Excess of tension is difficult to estimate, especially when it is first encountered in vessels whose walls have already become thickened. Under its influence the pulse becomes hard and resistant, so that the artery can be rolled like a cord under the finger ; its lumen is with difficulty obliterated, and even the firmest pressure may fail to obliterate the pulse-wave entirely below the point at which the pressure is applied, unless the blood-stream through the ulnar artery (supposing the radial vessel to be under observation) be simultaneously arrested, so as wholly to cut off the distal circulation. The sphygmographic tracing of such a pulse shows a sloping, short upstroke, a flat

summit, and a gradual descent in which the dicrotic wave is very slightly marked. Increased tension may further be recognised by a muffled prolongation of the first sound of the heart and an accentuation of the second aortic sound ; and, in cases where it has been present over a considerable period of time, by hypertrophy of the left ventricle. Its early recognition is of paramount importance, because upon the care which is bestowed upon it when it first becomes established depends very much the continuance of arterial elasticity, and it is this which connotes the expectation of life. The existence of increased tension should at once suggest enquiries as to family and personal history, and these ought to be specially directed towards the discovery of evidences of syphilis or of gout, either inherited or acquired ; towards habits of dietetic or alcoholic excess, or of physical or mental overstrain, past or present ; and towards signs indicative of renal inadequacy. Though laborious occupations or the excessive indulgence during youth or early manhood in athletic exercises are the most frequent mechanical antecedents of vascular disease, they do not constitute the only form of strain which may be held responsible. The condition may also be led up to by continued mental anxiety or brain-work. It is often, says Professor Stengel, "active members of the better class, men who have achieved much and suffered much, though outwardly successful, that fall early victims to this disease."

It is not putting it too strongly to say that all varieties of functional and organic change are correlated directly or indirectly with alterations in the blood-vessels, and that, in direct proportion as the vascular abnormalities are accurately recognised and dealt with when the symptoms with which they are associated are still of the functional type, so may it be hoped to avert or mitigate the organic disorganisation which will inevitably follow. The following cases have been under the writer's recent observation, and they serve to indicate with sufficient clearness three typical varieties of disturbed health, which will be familiar to the experience of every practitioner, and which pourtray, from different points of view, what may be regarded as the threshold of old age.

Case 1.—A. B., a man of 37 years of age, was the heir of gouty antecedents which could be traced back through many

generations. He had lived abstemiously, and did not admit having suffered from syphilis ; the only illness which he was known to have had was renal calculus, with which he was afflicted some years ago, but from which he made an apparently perfect recovery after the passage *per urethram* of several phosphatic concretions. His professional career had been unusually brilliant, and he had been from his school days assiduous in his work and ambitious to succeed. Soon after his recovery from the renal infirmity above mentioned, he was appointed to an important position, into the duties of which he entered with all the enthusiasm and thoroughness characteristic of his previous life. He was called upon to live in a sub-tropical country during the hottest months of summer and autumn, and in September he began to suffer from headaches, giddiness, imperfection of vision, and impairment of memory. He sought relief in a short holiday among the mountains, but the improvement he hoped for did not take place, and he came home. On his return, the most striking fact about him was that he had aged very considerably within the two years that had elapsed since he was previously under observation. He had lost flesh, his hair had become thin, his skin was dry and of the "parchment" description, and his usual animation had become replaced by an abstraction of manner and a striking sadness of facial expression. He had experienced no return of renal symptoms, but his urine, though free from albumen, was of a persistently low specific gravity. He was disinclined for effort of any kind, and, if left alone, was content to spend the greater part of his day in bed. His pupils were unequal, the right being slightly, but perceptibly, larger than the left ; there was no nystagmus or weakness of the ocular muscles, and the discs were normal. His memory was distressingly impaired for recent events, and he manifested a lack of engrossment in such occurrences of his everyday life as would formerly have been of supreme interest to him. He suffered from occasional vertigo of minor degree, but had no headache. His knee-jerks were sluggish, but came out on reinforcement. His appetite and digestion were good, and his bowels regular. The apex-beat of his heart was displaced slightly outwards and downwards, and the aortic second sound was accentuated, but there was no murmur. His pulse was

persistently of the high-tension type, and his arteries were unduly prominent and slightly tortuous. His organs otherwise were normal. He had no craving for alcohol, but, when occasion offered, he indulged in it more freely than he had ever done before. Under the influence of rest and feeding he put on weight and improved generally, but even at the present time, when he is vegetating in the country, he is still absent-minded, forgetful, and unlike his former self. His case is a problem in diagnosis :—Was the sudden responsibility consequent upon his promotion, coupled with a keen and conscientious desire to justify his appointment, with broken sleep which the nature of his work entailed, and with a constant exposure to excessive heat and an overpowering sun, the whole explanation of his breakdown ? Or were his symptoms dependent upon cerebro-spinal changes of the type which we are accustomed to associate with general paralysis ?

These interrogations can only be answered in the light of future developments, but the present condition of his health justifies considerable anxiety. The specific history must be taken for what it is worth, but there is no collateral evidence of his having suffered from or inherited syphilis. On the other hand, his life-record is one of precocious mental brilliancy and of unremitting hard work. The physical condition of his arteries, the mental obtusion, and the persistent low specific gravity of his urine are ominously suggestive of a commencing widespread degeneration of senile type at an abnormally early age.

Case 2.—C. D. is a lady of 48 years of age, the mother of five children, and herself the youngest of a family of three, all of whom had suffered from neurotic manifestations, but were otherwise healthy. Up to the time of her marriage this lady had been delicate, and was at an early period threatened with tubercular disease of her lungs ; but she had never completely broken down, and there was no physical evidence in her chest of any organic damage. From the date of her marriage her health improved, and the increasing anxieties of her domestic life seemed to leave her no time to think of herself. She passed through her confinements without special difficulty, and her recovery from parturition was, in each instance, speedy and uncomplicated. Her children were delicate, and demanded

during the earlier years of their lives, her unremitting attention. One died in infancy from meningitis, and of the others, two were steered through the dangers of repeated serious illness by the devotion of their mother. In addition to these constant anxieties at home, this lady devoted herself extensively to good works among the poor, and was at the beck and call of every neighbour or relative who was sick or distressed. For close upon twenty years she pursued this life of unselfish and arduous duty without apparently suffering in her own health. Her sleep was often cut down to the narrowest limits during periods of several weeks at a time ; she allowed herself little or no relaxation from the responsibilities of her environment ; was neglectful of her own requirements in regard both to exercise and diet ; and, in her anxiety for the welfare of others, she paid no heed to the duty she owed to herself. At the age of about 45 her menstruation became somewhat irregular, and she experienced occasional attacks of temporary prostration, which compelled her to seek the help of rest and medicine. Her life, between whiles, was still a busy one, and was still constantly beset by cares and anxieties. No accurate record was kept of her physical condition until she was attacked, about a year ago, with an illness of influenzal type. During her convalescence she experienced for the first time discomfort referable to her heart, and went through several paroxysmal attacks of praecordial pain, dyspnoea, and circulatory disturbance suggestive of angina pectoris. In time, she improved sufficiently to leave home, and, when first seen by the writer, was on her way to the seaside for change of air. She was thin and careworn, and looked older than her years ; but investigation failed to detect any organic fault. Her heart was feeble, the apex-beat was displaced somewhat outwards, and the second sound was strongly accentuated, but there was no murmur at either orifice. There was increase to a considerable degree of the pulse-tension, and the pulsations of the larger arteries were unduly prominent. The aorta could be seen beating in the episternal notch, and its throbings were unpleasantly prominent throughout the upper part of the abdomen. The urine was normal, but of low density. Her nervous system was unstable ; she was emotional, easily tired, and lived in constant dread of a recurrence of her anginal attacks. Memory was impaired, and

she complained of uncomfortable passing vertigo on any change of position. Her knee-jerks were brisk and of the neurasthenic type. She had broken sleep at night, her appetite was poor, and she had become a martyr to flatulence and other evidences of atonic dyspepsia.

Within a few days of her arrival at the seaside she developed anew symptoms of vaso-motor disturbance ; her pulse became rapid and irregular, and she had repeated syncopal attacks, which were soon followed by a recurrence of anginal symptoms similar to those which she had experienced at home. Treatment failed to afford relief, and her attacks of praecordial distress became so pronounced and apparently so serious that they were regarded as true angina, and were made the basis of a very grave prognosis. After a period of rest and careful management, however, she improved sufficiently to admit of her return home, but under the burden of a promise that she would lead the life of a complete invalid for at least a year. The improvement being still maintained over some weeks, she became restive under the restraint and ennui of constant inactivity ; and as there were still no evidences of organic mischief in her heart, it was decided to relax judiciously the severity of her régime and allow her to resume, in a modified way, her normal life. For some months now this plan has been carried out successfully. There has been no return of cardiac distress, but the arterial tension has required occasional correction by nitroglycerine and iodide of potassium.

In this case, the sequence of events points strongly to excessive wear and tear as the explanatory cause of the pathological condition. There could be no suspicion of a specific cause, but the history plainly enough indicated a neurotic inheritance which was likely to bear the burden of life badly. The marvel is that under the influence of such a continuous drain upon her strength the inevitable breakdown did not occur earlier. Her tissue-vitality was apparently good enough to withstand the strain over a long period of years ; but when climacteric changes diminished her powers of resistance, she was overtaken by the penalty of an over-strenuous life. Fortunately for her, a kindly providence, disguised in the unwelcome cloak of pseudo-angina, sharply commanded her to mend her ways before it was too late, and before her neurotic

inheritance, coupled with the stress of daily duty too intensely performed, had gone the length of producing permanent degenerative changes in her vascular walls, and of making her, from the "tissue" point of view, prematurely senile.

Case 3.—E. F., a man of 37 years of age, was the inheritor of a family disposition which, throughout at least two generations, was abundantly tainted with gout and alcoholism. The patient had never suffered from syphilis or from any form of serious organic disease. From earliest manhood he had indulged freely in rich food and every variety of alcoholic beverage. He was much above the average in mental activity, and was a keen and active sportsman. When no more than 28 years of age, he began to suffer from recurrent attacks, the account of which suggested that, in their nature, they were probably similar to those subsequently observed by the writer. He never had gout in its acute and classic form; but from that age onwards his digestion became fickle, and he experienced, at short intervals, attacks of gastric disturbance, of which the leading symptoms were fulness and discomfort some hours after food, anorexia, heartburn, vomiting, constipation, scanty urine loaded with lithates, a furred tongue, and mental depression. When first seen, at the age of about 31, he was suffering from one of these catarrhal seizures, admittedly on this occasion induced by a week of revelry, with the usual accompaniments of late hours, irregular and rich meals, and a liberal allowance of alcohol and tobacco. Apart from the ordinary symptoms produced by the temporary congestion of his internal organs, the features of greatest importance in his condition were a pulse of exceedingly high tension, with its necessary complement of an accentuated aortic second sound and a forcible impulse of the apex-beat which was situated below the sixth rib and in the nipple-line. There was no valvular murmur. The urine was high-coloured and full of urates, but it contained neither albumen nor sugar. After recovery, his pulse was still of high tension, and his urine had become pale and of low specific gravity, but did not contain albumen. From this time onwards he was seen at frequent intervals, and there has been a gradual development of moderate, but unmistakeable, tortuosity of his arteries; of intermittent slight albuminuria; and of occasional illnesses characterised by mental apathy,

sleeplessness, disturbed digestion, and restlessness. The urine has never contained blood nor degenerative renal epithelium, and only occasionally a few hyaline casts, but its average specific gravity has been 1010, and the amount of urea has always been subnormal. On a recent occasion there was a moderate haematemesis. There is some diminution in the area of hepatic dulness, and the patellar reflexes are sluggish and difficult to elicit. His life is now comparatively simple and well-ordered, and his gastric attacks occur only at long intervals. He is well nourished, and though still vigorous when well, he requires little excuse to keep his bed for a day or two at a time, and is less keen on active pursuits than hitherto.

Here is a case in which the picture of arterial degeneration is being gradually unfolded before our eyes. A faulty inheritance and habits of free living, which, however, have never gone the length of pronounced excess, have induced, at an early period of life, attacks of what may be fairly described as irregular gout with persistent high tension characteristic of peripheral arterial resistance ; manifesting itself first and foremost in the kidneys, then in the liver, and latterly presenting occasional symptoms pointing to some implication of the cerebral vessels, the whole being confirmed by evidences of thickening and lengthening in the radial, temporal, and other superficial arteries. This is one of the instances in which, as Osler puts it, "in the make-up of the machine bad material was used for the tubing." The patient would probably have become old before his time, no matter what had been the manner of his life ; but the round of gaiety and pleasure in which he indulged for a time along with the young men of the circle in which he moved, has strained the weak link in his vital chain in such a way as to hasten on the pathological propensities with which he was endowed, and has exposed him, at this comparatively early age, to the dangers that physiologically belong to a man of twice his years.

In none of these cases can it be said that the symptoms justify the assumption that the arterial changes have passed into the domain of actual atheromatous degeneration, which may probably be accepted as the vascular type of established senile decay, but it cannot be gainsaid that each of them, from

a different cause and through a different portal, is prophetic of the day when "the silver cord shall be loosed."

If such conditions of disturbed health are regrettable from the point of view of the indications which they afford of a premature and undesirable degeneracy of tissue, they may be welcomed as furnishing us, when early enough recognised, with a golden opportunity for the adoption of measures to stay the progress of destructive processes and to prolong the continuance of useful lives. Every living being must ultimately die ; but, if extraneous causes of premature decay could be eliminated, the end would be a kindly euthanasia, which would only ensue when the tissues, from the mere weight of years, had accomplished the span of their inherent vitality. To ensure this accomplishment of a natural law is the goal of medical ambition. It may never be achieved ; but every discovery of science, every new and worthy therapeutic advance, every hygienic improvement, every emancipation from social unrighteousness, and every evasion of inherited or acquired personal depravity, is a step in the direction of that health-millennium to which humanity aspires, and which, theoretically at any rate, is not impossible of achievement.

Physiological old age which, as we have seen, too often arrives under the influence of adverse circumstances long before its appointed time, normally declares itself first through the vascular system, and the changes which the arterial walls undergo may be summed up as a sequence of primary irritation, subsequent chronic inflammation, and ultimate atheromatous degeneration.

Whenever the arterial walls have become uncontestedly thickened, even though it may be impossible to know that they have reached the point of atheromatous change, the early stage of senility, so far as the vascular system is concerned, has been entered upon ; complete restitution of normal elasticity is impossible, and the most that can be hoped for is an arrest or delay of the pathological process which has begun. Vessels that are at all conspicuously thickened are recognised by being more than usually rigid and inelastic, by an increase in their normal diameter, and by tortuosity which results from their stretching under the pressure of the blood-current. They look abnormally prominent and superficial, and to the finger

they feel hard and incompressible. This vascular condition does not necessarily give rise to constitutional disturbance. Most persons, indeed, are apparently in the enjoyment of excellent health, and are quite unaware that anything ails them beyond perhaps an occasional attack of "billiousness" or "indigestion." But, from one cause or another, their metabolism has become imperfect, the quality of their blood has in consequence become depraved, and, by its irritative action on their arterioles and capillaries, it has set up changes which in time produce the vascular thickening which we recognise as indicative of age. In this connection it is not unreasonable to assume that many of the general symptoms, such as headache, drowsiness, lassitude; irritability of temper, vertigo, disturbance of digestion, flashes of light before the eyes, noises in the ears, &c., which are variously, and no doubt correctly enough, attributed to gout, sluggishness of the liver or some obscure form of toxæmia, are, like the high-tension pulse which invariably accompanies them, closely related to the subsequent development of arterial sclerosis.

The hypertrophy of the left ventricle which ensues upon loss of arterial elasticity is at first of the simple concentric type ; but, later on, the progressive changes in the walls of the aorta lead to straining of the aortic valve which, in its turn, frequently becomes the seat of degenerative decadence. The ventricle then dilates in order to maintain compensation, and we are in the presence of all the dangers that belong to a condition of imminent aortic valvular disease. Even at this advanced stage of events, the patient may still, with reasonable care, retain a fair measure of health over many years ; but he is now travelling on thin ice which may any day give way under him. A wide variety of circumstances determine the direction in which break-down may take place, but the organ or tissue in whose vessels the arterial changes have advanced furthest is obviously in greatest jeopardy, and not infrequently evidence has been forthcoming, as in the cases which have been related, at an earlier period of life, of the situation in which serious developments are most to be dreaded. The heart, brain, kidneys, lungs, or peripheral vessels are specially liable to give indications that they have come under the sway of this degenerative process.

Compensatory hypertrophy of the left ventricle of the heart, which is a physiological provision for maintaining the balance of the circulation, is found in the large majority of old people. Charcot described it as the legitimate result of senile alteration in the arteries. Bizot, on the other hand, declared that it occurred in old age without exception, and that normal loss of arterial elasticity was sufficient to account for the change in the structure of the heart, apart from any question of pathological change in the arterial tunics. As long as the heart responds adequately to the call for extra exertion demanded of it, the individual has no knowledge that he is the possessor of such an organ ; but as soon as the peripheral resistance becomes greater than it can comfortably overtake, or the myocardium becomes weakened from impairment of its nutrition, it is no longer able completely to fulfil its appointed task. Its failure may be induced by many causes. One of the most frequent is inadequacy of the coronary vessels from degenerative changes in their walls, with consequent fatty or fibroid metamorphosis of the heart-tissue. This leads to dilatation, backward pressure through the lungs and right heart, dropsy and ultimate oedema of the lungs. But there are other dangers attendant upon coronary sclerosis which may be responsible for a more sudden death than that which follows on broken compensation. The degenerated myocardium may bulge at some specially weak spot, giving rise to an aneurysm of the heart, which is liable to rupture at any moment ; thrombosis may take place within the artery and cause sudden death ; angina pectoris may either kill the patient or warn him of his uncertain tenure of life ; or an accompaniment of degenerative changes in the vessels of the brain may produce a characteristic combination of cardiac and cerebral symptoms.

The most common event is angina pectoris. The pain which accompanies the earlier attacks, when the vessels are probably only moderately affected, is of slight intensity only, and so fleeting that it is ascribed by the patient to rheumatism. Rheumatism in the muscles of the chest is not common, and the pain by which an ordinary myalgia is accompanied differs entirely from that caused by such a serious condition as angina. Nevertheless, the medical practitioner is liable to be lulled into a sense of false security by a recital of subjective symptoms

whose apparent unimportance seems to be verified by an outward appearance of health ; and, unless he is careful to investigate the circumstances thoroughly, he may get an unpleasant awakening to the true explanation of the chest-pains in the sudden death of his patient.

A slow arrhythmic pulse occurring in a person with thickened arteries should always arouse suspicion of coronary incapacity ; and if this be associated with attacks of syncope or of passing unconsciousness, it constitutes the condition first described in Dublin by Robert Adams and William Stokes, and sometimes spoken of to-day as "Stokes-Adams disease." In cases coming under this category the pulse-rate is always slow—from 20 to 30 ; there is an advanced degree of atheroma ; the patient is always well up in years ; and cerebral attacks, which may be either vertiginous, syncopal, or epileptiform, are of frequent occurrence. They are not followed by paralysis, are not accompanied by anginal symptoms, and seem to be induced by any circumstance which throws extra effort upon the action of the heart. Other cardio-vascular phenomena which may result from the development of the atheromatous process are aortic valvular disease or aortic aneurysm.

The cerebral symptoms associated with arterial degeneration are many, and vary according to the situation of the vessels principally involved. Vertigo is a frequent manifestation, and it may be associated with transient monoplegia, hemiplegia, or aphasia. When the vessel-walls are much thickened and their calibre is lessened, any sudden change of posture, mental excitement, or physical effort tends to produce anaemia of the brain, with consequent dizziness, faintness, and mental confusion. If this anaemia becomes chronic, mental effort gets increasingly difficult. Apathy, irritability of temper, tinnitus, tremor, slurred speech, loss of memory, and headache of varying intensity frequently occur in association, and present a picture closely resembling that of general paralysis. The most important results of vascular changes in the brain are haemorrhage, usually the result of rupture of a miliary aneurysm, and softening, which ensues whenever an area of cerebral substance becomes necrosed from the cutting-off of its nutritive supply.

Renal symptoms supervene in a large number of cases and correspond with those we are accustomed to regard as indicative

of chronic interstitial nephritis. In most instances it is impossible to be sure whether the arterial or the renal disease has been primary.

The pulmonary symptoms associated with atheroma are those of bronchitis and emphysema, with all the concomitant dangers of right-heart failure.

In the vessels of the limbs in old people, especially in the popliteal and tibial arteries, degenerative changes frequently become responsible for the development of senile gangrene.

There are thus many pathways along which old age travels ; and when once his foot is on the road, little can be positively predicated concerning the speed of his progress. The prospect of life and health varies with the stage at which the arterial change has already arrived, with the organ or tissue most markedly affected, and with the previous history and present habits of the patient. If high arterial tension is recognised early, and if measures are adapted to overcome it and to minimise the danger of its recurrence by a suitable regulation of the dietary and general routine of daily life, much will thereby be done to postpone or prevent the actual occurrence of structural changes in the vessel-walls. After these have become established, no form of treatment can wholly restore the artery to a normal state. But if the patient's circumstances are such that he can withdraw himself from the anxieties as well as the pleasures of the world, he may do much to stave off the evil day. The degenerative process is progressive, even if it be slowly so ; and therefore, though judicious management may avert a calamity over a longer or shorter time, the ultimate issue must be a break-down at the weakest spot, and according to the nature and situation of the lesion which is then produced, will the number of the patient's days be measured.

There is no difficulty in the recognition of arteriosclerosis when it is fully established, so far as the vessels which are within the reach of physical examination are concerned. The condition of the vessels distributed to deep organs can only be a matter of conjecture ; but the change in the superficial vessels is not likely to be confined to them alone, and organic disturbances, arising under such circumstances, may be regarded as consequences of a similar degeneracy in the arterioles and capillaries by which the organs affected are supplied. There

are three leading questions which should be put to every patient suffering from premature arterial changes :—Have you suffered from syphilis or gout ? Have you been a free-liver and in the habit of indulging generously in alcohol and tobacco ? Has the nature of your occupation or pleasure been such as to put undue strain upon your tissues ? Enquiry should also be made as to the family history, with a view to finding out whether ancestors have been old before their time or whether the prevailing causes of death among them have been such as arterial degeneration would best account for.

As regards treatment, the leading indication is to maintain the nutrition of the body and to limit the daily demands upon physical and mental energy as far as is necessary to obviate the risk of stress. The time is arrived when it has become imperative

“ To husband out life's taper at the close,
And keep the flames from wasting by repose.”

The patient must lead an absolutely quiet and uneventful life, curtail his business responsibilities, and avoid every form of dietetic excess. Where there is a tendency to gout, red meat, beef-tea and meat-essences are best avoided, and the dietary should consist of farinaceous foods, white fish, chicken, game and clear thin soups. Wines and malt-liquors are counter-indicated, but a small quantity of fully-matured and well-diluted brandy or whisky may be allowed with luncheon and dinner. Gentle exercise should be taken in the open air every day, and at least ten hours out of the twenty-four should be spent in bed. Rest on the sofa for an hour or more during the late afternoon is also to be commended. Measures must be taken to provide for the daily evacuation of the bowels. The constitutional vigour will be promoted by the periodical administration of simple tonics, such as quinine, arsenic, strychnine, iron or the mineral acids.

Apart from these general principles, each patient demands treatment according to the special circumstances of his case. When there is a combination of anginal attacks with persistent high-tension pulse, vertigo, and dyspncea on exertion, striking relief will be afforded by iodide of sodium in ten-grain doses, combined with two minims of a one-per-cent. solution of nitro-glycerine, and three minims of Fowler's solution, in an ounce of

infusion of gentian or decoction of bark. This mixture ought to be given, at first, every four hours, but less frequently after improvement becomes established. Its effect will be enhanced by the administration every night for a week of one grain of calomel, followed in the morning by a sufficient dose of sulphate of soda, Carlsbad salts, or one of the natural mineral waters to ensure an effective result. Until the pulse-tension has diminished and the anginal manifestations have subsided, the patient should be kept constantly in the recumbent position.

When the pain is severe and does not rapidly yield to this form of medication, morphine should be administered hypodermically and the best result will be obtained from a full dose of half a grain. If the condition has become one of broken compensation and there is evidence of cardiac dilatation, digitalis must be boldly given in fifteen or twenty-minim doses combined with one minim of nitroglycerine-solution every three or four hours, until evidences of saturation, in the form of vomiting, slow pulse, and diminished urinary secretion, declare themselves. This seldom takes place before the heart has steadied down sufficiently to enable the quantity to be considerably lessened. The reason why treatment fails in so many of these cases is because the digitalis is not courageously enough given. If its effects are carefully watched, there need be no fear in pushing it freely during the early stages of its administration. When the myocardium shows signs of weakness, stimulants are necessary, the best being champagne or brandy. The hypodermic injection of five minims of strychnine twice or three times a day may also be required to tide over a critical time. When the dilatation has given rise to backward pressure, and especially if this has gone the length of producing cyanosis and engorgement of the liver, eight or ten leeches should be applied over the hepatic region, or if the urgency is great, blood may be unhesitatingly abstracted from the arm to the extent of eight or ten ounces.

Cerebral manifestations, aortic disease, aneurysm, thrombosis, renal disease, emphysematous bronchitis, and the many other organic conditions with which arterial degeneration is so frequently associated, must be managed on general principles.

From the prophylactic point of view much may be done to

delay the advent of arterial changes if the patient is seen early enough, and if he will consent to regulate his remaining life in accordance with a reasonable plan. His position should be fully and candidly set before him, and he ought to be made to understand clearly that, in great measure, he is master of his own fate, and that it depends entirely on the curtailment of wear and tear how long he may expect his arteries to hold out and satisfactorily to carry on the nutrition of his tissues. The fashionable lady who adopts the devices of art and often the pretentious promises of quackery to preserve the graceful lines of her figure, to maintain the colour of girlhood in her hair, and to banish the wrinkled testimony of time from her face, would achieve her purpose better if, at or about fifty, she sought the advice of her doctor and accepted his directions for a régime which—though it might imply the curtailment of appetites excessively indulged, the cessation of habits inimical to health, and the limitation of social and domestic ambitions—would minimise the ravages of age, not by any attempt at their concealment, but by a scientific endeavour to delay them.

It would be well if we all, men and women alike, bowed gracefully to the inevitable, accepted our record of years at its true enumeration, and so regulated our behaviour when we had crossed the summit of life's pilgrimage, that the downward journey was rendered slow and cautious by the adoption of, and perseverance in, habits of work, repose and pleasure suited to the age at which we had arrived. The evil day of incurable atheroma can be warded off only by careful and abstemious living, freedom from excess of work and worry, and maintenance of the ordinary bodily functions in normal activity.

When arterial degeneration threatens, that person will come off best who wholly abstains from alcohol and tobacco, eats sparingly of nitrogenous food, indulges in a reasonable amount of out-door exercise, lives an uneventful life in the country, and periodically has the state of the vessels overhauled, so that any excess of arterial tension may be at once counteracted by suitable remedies. In all cases where there is a history of syphilis, it is a safe precaution to submit from time to time to a short course of iodide of potassium and mercury.



HOW TO TREAT BACKWARD DISPLACEMENT OF THE UTERUS.¹

By THOMAS WATTS EDEN, M.D., M.R.C.P.,

Assistant Obstetric Physician, Charing Cross Hospital; Physician to In-Patients, Chelsea Hospital for Women; Physician to Out-Patients, Queen Charlotte's Lying-in Hospital.

By backward displacement is understood the condition in which the body of the uterus, instead of being, as is usual, directed forwards towards the bladder, is directed backwards towards the sacral hollow. In my opinion the distinction between a "version" and a "flexion" is of minor importance. The angle formed between the body and the neck of the uterus will be found in different healthy individuals to vary very considerably, and no precise definition of what constitutes "flexion" is possible; but for practical purposes, any marked exaggeration of the normal bend is called a "flexion." In what follows I shall therefore not attempt to discuss retroversion and retroflexion separately, merely remarking at this point that a marked bend sometimes appears to increase the severity of the symptoms associated with the displacement.

It is necessary in the first place to put the question, "Does backward displacement of the uterus require treatment in every instance?" This question can be definitely answered in the negative. My experience of gynaecological out-patients first led me to this opinion; but I do not ask you to take it upon trust, because elaborate clinical proof of it has been recently worked out by Schröder.² This observer carefully investigated the position of the uterus in 411 hospital patients and others, anaesthesia being employed for the examination whenever necessary. Of this number 93 were healthy individuals, and expressed themselves as feeling perfectly well. Two-thirds of the total number, according to Schröder, had no "pelvic symptoms" whatever, yet he found in 26 per cent. of these

¹ A lecture delivered at the Medical Graduates' College and Polyclinic.

² *Zeits. für Geburt. und Gynakol.*, Bd. XLIII., Heft 3, p. 413.

backward displacement of the uterus. Among the 93 healthy persons, 23·6 per cent. had backward displacement. Looking at his figures from another aspect, we see that in 118 cases of backward displacement, 2 out of every 3 were unaccompanied by pelvic symptoms. If the nulliparous women are considered alone, we find that in 30 cases of backward displacement, 4 out of every 5 had no pelvic symptoms. These observations prove conclusively that backward displacement of the uterus frequently gives rise to no gynæcological or other trouble, and further that this appears to be especially the case in women who have borne no children. I am personally quite in accord with Schröder's conclusions.

If all cases do not require treatment, how shall we distinguish those which do from those which do not? Before answering this question it will be best to consider the different varieties of backward displacement, or, to be more exact, the different conditions in which backward displacement may be encountered. It is convenient to divide our cases into two groups—(1) *Simple*, and (2) *Complicated*. By simple backward displacement is implied that the uterus retains its normal size and mobility, and that no other morbid condition of the pelvic organs is present. Complicated cases are those in which other lesions are present, either of the uterus itself or of the other pelvic organs. Simple cases very rarely require treatment, complicated cases usually require it; but in no department of medicine or surgery can hard-and-fast rules be laid down, least of all, perhaps, in gynæcology, and many exceptions to the above rule will be met with.

We will first consider simple cases. Those which are not associated with pelvic symptoms—pain in the abdomen and back, dysmenorrhœa, menorrhagia, leucorrhœa, and, in the married, dyspareunia—need no local treatment. One or two exceptions exist to this rule. Firstly, there is the case of the sterile woman with simple backward displacement; in this instance the displacement should be corrected, as the backward position of the uterus, by displacing the cervix forwards, may add a little to the length of the journey which spermatozoa lodged in the posterior *cul de sac* must make to reach the uterine cavity. In a sterile woman, therefore, backward displacement should be corrected, even if it gives rise to no

distress. Then there are the puerperal cases. Backward displacement met with during the six or eight weeks of the puerperal period should be corrected, whether causing trouble or not, as the important process of involution is undoubtedly hindered by the slight circulatory disturbance which results from it. The consideration of the lines of treatment required for simple cases will be postponed for the present.

Sometimes simple displacement is found in association with what we have just described as "pelvic symptoms." Great care is here required to determine whether the symptoms are produced by the displacement or are accessory to it from some other cause. Mimicry of other diseases is one of the best-marked features of hysteria, and nothing is simpler than to conclude that a train of symptoms, such as those enumerated above, must be due to simple backward displacement when that condition is present. If the patient is of the familiar neurotic type, we must "beware in time," for here treatment is practically certain to aggravate the symptoms instead of relieving them. But these circumstances obviously call for the exercise of cool and careful judgment, because the converse error of attributing to hysteria symptoms due to a pelvic lesion, must be scrupulously avoided. A safe general rule when in doubt is—*Never begin with local treatment; try general measures first, and only in case of failure with these adopt local treatment.* These remarks apply to all cases, but with the greatest force to the unmarried.

Turning now to *complicated cases*, the complications which may be met with are numerous, and may be divided into two groups:—(a) consecutive complications, i.e., those which result from the backward position; and (b) independent complications, i.e., those which arise from some other cause. They may be enumerated thus:—

Consecutive Complications.

- (1) Hypertrophy of the endometrium (so-called "endometritis").
- (2) Thickening and erosion of the lips of the cervix.
- (3) Prolapse of the ovaries.
- (4) Dilatation of the uterine cavity (case of pyometra recorded).

Independent Complications.

- (1) Pelvic inflammation, causing—
 - (a) adhesions to pouch of Douglas ;
 - (b) Salpingo-oophoritis.
- (2) Uterine fibroids.
- (3) Cystic ovarian disease.
- (4) Prolapse (uterine).

It is clear that the relative importance of the complications in these two groups is by no means the same. The conditions enumerated in the second group are, in every instance, of more importance than the displacement which accompanies them. The consecutive complications, on the other hand, are dependent upon the displacement ; and although they are often the chief cause of the symptoms of which the patient complains, they can never be considered apart from the displacement itself. Consecutive complications can often be cured by correcting the position of the uterus ; independent complications call for a special line of treatment which is of much more importance than the correction of the displacement.

Consecutive Complications.—Their mode of origin requires brief consideration. Changes in the endometrium and in the cervix (1 and 2) usually go together. They result from the circulatory changes induced by the backward position. In this position a certain amount of hindrance to the venous return from the uterus through the pampiniform plexus is inevitable ; in some cases, as Dr. Herman has suggested, the broad ligaments may become actually nipped between the uterus and the edges of the utero-sacral ligaments, when the body is completely turned backwards. The result is venous congestion, leading to hypertrophy of the mucous membrane, and, no doubt, to a less extent, causing hypertrophy of the muscular and fibrous tissue of the uterine and cervical walls. If this explanation is correct, then it may be urged that all cases of backward displacement should of necessity sooner or later be complicated with endometritis, whereas clinical experience shows that this is not the case. It must be remembered, however, that a large proportion of those which we have called “simple” cases are congenital, or, if not congenital, have at any rate occurred at an early period of life, when complete adjust-

ment of the circulation to the altered position was possible. Cases in which displacement arises in adult life are probably incapable of this adjustment, and as a result they become complicated by "endometritis."

An interesting demonstration of the truly consecutive nature of cervical erosion and thickening in backward displacement has recently been furnished by Dr. W. J. Sinclair.¹ He recorded a series of cases in which ventrofixation was performed for this condition, no other treatment whatever being adopted. Before operation a coloured sketch of the appearance of the cervix as seen through the speculum was made in each case, showing the erosion and thickening which were present. After operation, a series of similar sketches were taken at intervals, which showed that the cervix gradually returned to a normal and healthy appearance under the sole influence of correction of the displacement. No local treatment was applied to the cervix in any case.

Prolapse of the ovaries into Douglas's pouch or the lateral rectal pouches is common enough in backward displacement, and almost invariably aggravates considerably the symptoms from which the patient suffers. Sometimes one of the ovaries lies actually beneath the retroverted uterus upon the floor of the pouch, giving rise to pain in the back, dyspareunia, and dyschesia. Ovaries thus prolapsed are often swollen and tender, the result, no doubt, of congestion resulting from interference with the circulation through the broad ligaments. It may easily be shown that the displacement of the ovaries depends upon the faulty position of the uterus, by correcting the latter, when the ovaries will be observed to rise with it into approximately their proper position.

Dilatation of the uterine cavity, to a slight extent, accompanies endometritis, causing an increased measurement by the uterine sound. Rarely the dilatation may reach a considerable extent and become a source of danger, as the following case shows :—

On May 16, 1903, my friend Dr. Maguire, of Richmond, sent up to me for consultation, at the Chelsea Hospital for Women, a patient, S. E., aged 63, who complained of a vaginal discharge of eighteen months' duration. She had had four

¹ *Journal of Obstet. and Gynacol. of the British Empire*, Vol. IV., p. 249.

children, and the menopause came on when she was fifty years of age. From that time until eighteen months before I saw her she had been in good health. The discharge of which she complained was at first thick and yellow ; lately it had been occasionally blood-stained, and had become very offensive. Her general health was good ; there had been no wasting, and there was no pain or other symptom present. On examination in the out-patient room I made out the presence of a swelling in the pouch of Douglas, which both to vaginal and rectal examination was tender, but ill-defined ; and I judged it to be the enlarged uterine body. The speculum showed intense vaginitis about the vaginal *cults-de-sac*, the mucous membrane appearing raw and exuding blood pretty freely. A thick, very foetid, purulent discharge issued from the os externum. The sound was not passed, but the patient was advised to enter the hospital at once, as I suspected that the case was one of malignant disease of the body of the uterus.

On May 22, having ascertained that the length of the uterine cavity was four inches, and that the cervix was easily dilated, I proceeded to explore the uterine cavity under ether. During the process of dilatation about $1\frac{1}{2}$ ounces of thick foetid pus escaped from the uterus. The body was completely retroverted, and the portio vaginalis had practically disappeared from age-atrophy. On passing my finger into the uterus, I found the walls everywhere smooth and free from growth ; they felt soft and thin, like a half-inflated rubber bag. The other pelvic organs were free from disease. The uterus was well douched with an antiseptic solution, swabbed thoroughly with iodised phenol, and then packed with iodoform-gauze.

She made a rapid recovery. The temperature on the evening before the operation was 99° F. ; on the day following it rose to $100\cdot 2^{\circ}$; for the next three days the evening temperature was 99° , and thereafter it remained normal. The gauze was changed and the uterus cavity douched daily for 10 days, when all discharges had ceased. She left the hospital on the 15th day apparently cured.

In this case the accumulation of pus within the uterine cavity can only have been caused by the backward position of the uterus leading to the retention of secretions, possibly from an inflamed endometrium (senile endometritis), and decom-

position of the retained secretions from vaginal contamination. A retroverted uterus drains badly, and but for the contracting power of the muscular wall retention of menstrual and other secretions would no doubt be of frequent occurrence with this displacement. In the uterine wall of a woman 10 years past the menopause there is not much muscle; its contracting power would therefore be lost, and the mechanical tendency to retention would be unchecked. This appears to me to be the explanation of this rare condition.

The independent complications need not be individually discussed.

Treatment.—The main object of treatment is the correction of the displacement, *i.e.*, the restoration of the uterus to a forward position and its maintenance in that position. As a preparatory step local depletive measures are often indicated.

The displacement may be corrected either by a pessary, or by an operation, and the relative position of these two methods of treatment is a matter of great importance. Treatment by a pessary has been long established, and is of engaging simplicity. The objections to it are:—(1) That it frequently fails to achieve its object—the restoration of the uterus to a position of anteversion; (2) its use once begun, can seldom be discontinued, *i.e.*, it is palliative, not curative; (3) it is a dirty method, and may lead to inflammation, ulceration, or sloughing of the vaginal walls. For these reasons I regard the use of a pessary as a temporary measure only, and restrict its application to those cases alone in which temporary measures will suffice. The frequent failure of pessaries is the chief count in the indictment against them. This failure is now generally admitted by writers who have taken the trouble to record and analyse a series of cases. Thus Sänger¹ reports that of 49 cases treated by pessaries, only seven cases (14.3 per cent.) were cured, while 42 (85.7 per cent.) were unrelieved. Fränkel, out of 294 cases treated by pessaries, could report only 8.2 per cent. of cures. On the other hand, Klötz and Prochownick have reported 24 to 25 per cent. of cures. But a method by which such a small proportion of cures can be obtained as 8 to 25 per cent. cannot be recommended with any degree of confidence.

In what classes of cases then can the use of a pessary be

¹ *Journal of Obstet. and Gynacol. of the British Empire*, Vol. II., p. 196.

advised ? This we can best arrive at by a process of exclusion. Unless the uterus can be first replaced, a pessary is useless ; this at once excludes cases for which such independent complications as adhesions of the uterus, and sometimes a uterine fibroid, are present. The object of using the pessary is to maintain the uterus in its normal position, and nothing can be more futile than to introduce a pessary without first replacing the uterus by the fingers or with the help of the sound.

In the next place, if it is found that the uterus returns to its faulty position notwithstanding the presence of the pessary, it is useless to continue this method, provided that the instrument employed was of a suitable size and shape for the purpose. Again, even supposing that the uterus is retained in position it may be impossible to discontinue its use, and no woman should be condemned to wear a vaginal pessary for the rest of her life, or at least for years, when other methods of relief are open to her.

From this it follows that pessaries are most suitable for those cases of "simple" displacement which require treatment. In puerperal cases, for example, one meets with success almost invariably, for after a few weeks or months have elapsed and the delay in the process of involution has been made up, the restored uterus will remain in its normal position without further assistance, and a permanent cure results. It is seldom necessary for the instrument to be worn for more than six months in such cases. In cases complicated by endometritis and cervical changes the chances of success are not so good, and many will ultimately require operation. Cases complicated with prolapse of the ovaries are rather more favourable for the use of a pessary, provided that the ovaries return to their normal position when the uterus is anteverted. Sometimes they will be found adherent, the adhesion being easily palpable as the uterus is carried forward and the ovarian ligament put upon the stretch. Such cases cannot be relieved by pessaries. The independent complications practically always contraindicate instrumental treatment.

The kind of pessary which I always use for backward displacement is the Hodge or Albert Smith pattern. They can be obtained in vulcanite or block-tin, or the latter may be covered with rubber. Block-tin has the advantage of being

easily moulded, and the instrument can be most conveniently adapted in length and breadth to the vaginal canal in which it will lie. They can also be obtained with glycerine or solid rubber pads in the position of the upper transverse bar (Greenhalgh's pattern), and this instrument is certainly sometimes more successful and better tolerated than the ordinary kind. Intra-uterine stems, and their various combinations with Hodge pessaries, I have never employed, and I deprecate their use entirely.

Local depletive measures are of great assistance in certain cases. When there is much tenderness and apparent fixation of the displaced organ, treatment should be commenced by sending the patient to bed for two or three weeks and instituting a course of appropriate local treatment. Hot vaginal douching with large quantities (2—3 quarts) of a mild antiseptic such as boric acid at a temperature of about 110° F., is perhaps the most important item. Glycerine or ichthysol plugs, or the same remedies in the form of vaginal suppositories, are also useful. The lower bowel should be kept empty by the daily use of a saline aperient, and an enema in addition, if necessary. Hot hip-baths of half-an-hour's duration will be found useful in severe cases. After two or three weeks of this treatment marked local improvement often results, and a uterus which at first appeared fixed may then prove capable of replacement. Local treatment of a cervical erosion caused by displacement is not to be recommended, for it can hardly ever be successful.

Operative treatment of backward displacement is a development of the last ten or twelve years' experience, but it now occupies an assured position in gynaecology. Three different methods have been widely employed, viz., ventro-fixation, vagino-fixation, and shortening of the round ligaments, and of the three the first-named is, in my estimation, far superior to the others.

Shortening the round ligaments by exposing their external extremities and drawing them out through the external inguinal ring was introduced originally by Alexander for prolapse, but was generally abandoned as unsuccessful. Re-introduced for backward displacement, it proved somewhat more reliable, and can now be performed, as Alexander first performed it, or by

opening the abdomen and shortening the intra-abdominal portion of the ligament, or by reaching the same portion through the anterior vaginal fornix. If adhesions are present, it cannot be performed with success. In any case the shortened ligaments tend to stretch again, and the displacement recurs.

Vagino-fixation (*i.e.*, suturing the body of the uterus to the edges of an incision made in the anterior vaginal fornix, after separation of the bladder), is more successful in correcting the displacement, but the position imposed upon the uterus is such an extreme degree of anteversion that dangerous complications have occurred in subsequent labour. Further, the operation is difficult, and adhesions in the pouch of Douglas are difficult to deal with, through an incision in the anterior vaginal fornix.

Ventro-fixation (*i.e.*, stitching the body of the uterus to the abdominal wall) has the following advantages :—

- (1) It is applicable to all cases ;
- (2) It allows such complications as adhesions to be readily dealt with at the same time ;
- (3) It gives a permanent correction of the displacement ;
- (4) It involves no serious complication in subsequent labour, when properly performed ; and
- (5) It involves no more risk to the patient than that of opening the peritoneal cavity, which, with modern asepsis, is extremely small.

In cases of backward displacement requiring operative treatment I have, therefore, no hesitation in recommending ventro-fixation. The method of performing the operation is well known, but the placing of the sutures is so important that I should like to describe briefly the plan which I adopt myself. I believe that it is a mistake to suture the posterior surface of the uterus to the abdominal wall, as is recommended by Howard Kelly. The fundus should be left free to develop without restraint, if pregnancy should supervene. In my opinion the sutures should be placed as low down as possible on the anterior uterine wall, avoiding the bladder below, and coming short of the fundus above. In this way a broad surface of the uterus is apposed to the abdominal wall, and a firm hold of the organ obtained, while the development of the fundus and posterior surface in subsequent pregnancy is unrestrained. The bladder accommodates itself readily to its altered relations, and

there is plenty of room for its lateral expansion. Silkworm-gut sutures are the best, and I usually employ four or five—three passing through the uterine wall and parietal peritoneum, and one or two others through the uterine wall, parietal peritoneum, muscle and fascia.

The general conclusions at which we have arrived may now be summed up as follows :—

1. Backward displacement of the uterus frequently gives rise to no symptoms, and requires no treatment. These are usually cases of "simple" displacement.
2. Where symptoms are caused by it, complications are usually present, which may be either "consecutive" or "independent."
3. Before adopting local treatment the possibility of the symptoms being hysterical should be carefully considered.
4. Pessaries should only be adopted as a temporary measure or in "simple" cases ; they rarely effect a cure.
5. Local depletion is a valuable adjunct to treatment by pessaries.
6. Cases unsuitable for treatment by pessaries, and cases in which pessaries have failed to cure, should be advised to undergo ventro-fixation.



SOME ASPECTS OF OBESITY.

By LEONARD WILLIAMS, M.D., M.R.C.P.,
Assistant Physician to the German Hospital.

LIKE many conditions which used formerly to be considered separate clinical entities, obesity is now regarded as merely a symptom of several, if not of many, underlying pathological states. It is not only not a disease *per se*, but occasionally it is not even strictly speaking pathological, inasmuch as its presence is apparently essential to the ordinary physiological working of certain individuals.

In its commoner forms obesity is due to a want of balance between intake and output ; either too much food is ingested or too little is oxidised. In many cases both these forces are at work in a superlative degree, the intake both as to quality and quantity being inordinately great and the output outrageously small. These cases are those which tend to excite the mirth of the ribald and the ingenuity of the caricaturist. They are represented typically by the broad man with florid complexion, short neck, and aldermanic abdomen, upon whose case the popular prognosis is that he will surely die of apoplexy.

Of course, all cases even of ordinary obesity do not lend themselves so readily to diagnosis and treatment as the above imaginary patient. The exact nature of the want of balance between output and intake is often very difficult to discover. It will nevertheless generally be found, if we are careful to enquire (*a*) into the ingested materials, their quantity and quality, and (*b*) into the facilities which the patient's mode of life affords to the normal oxidising processes, for exercising unimpeded their beneficent functions.

First, then, with regard to the ingested material. It may be excessive in quantity ; and in the case of those who have been athletic in youth this is by no means infrequent. Outdoor games and exercises during the growing period beget a habit of taking large and substantial meals ; the out-door exercises are perforce given up when the serious business of life is commenced, but the habit of large meals remains. It is,

as a rule, nothing more than a habit; but the remedy, if sufficiently obvious, is not always easy of attainment.

Another set of persons who habitually take more food than they can assimilate without injury are those deluded creatures (generally women) who imagine they want "supporting," as they term it. The typical patient of this class is the lady to whom the menopause has proved rather trying. She is very sorry indeed for herself, and feels so weak that she finds it necessary to be "kept up" by bin-hourly doses of something nourishing. Milk and beef-tea vie with tinned jellies and peptonised foods for the honour of conferring this nourishment, which on enquiry will generally be found itself to require supporting with a little alcohol. These cases are very difficult, indeed they are almost impossible, to treat successfully at home. The meagre effects of infinite tact and patience, laboriously exercised, while the victim is still amongst her ordinary surroundings, are as nothing compared with the results which may be confidently expected by sending such a case to a health-resort, preferably in a bracing climate, where the ritual of baths, massage, and drinking waters is substituted for the relaxing ministrations of the parrot, the parson, and the sympathetic spinster friend. It is the more necessary to remove such patients from these and similar influences, because in addition to taking too much food, they invariably commit those other obesity-inducing hygienic crimes to which I shall presently refer.

Another common cause of the ingestion of too much food is the practice of drinking fluid with meals. The fluid, even if it be not alcoholic, which it too frequently is, not only seems to increase the appetite, but, by enabling the food to pass more rapidly out of the stomach than it would otherwise do, it makes it possible for the patient to eat more. One can often reduce the proportions of a fat person very considerably by insisting that no fluid be taken during meals. The amount of fluid necessary for the healthy working of the body is best taken from half to a quarter of an hour before food, or, if this is inconvenient, it may be taken when all the solids have been eaten.

The importance of the due mastication of food is very generally recognised, but the recognition is, I fear, a rather

academic recognition, and some of us are even quite pleased if we remember to refer to the matter when giving directions to a patient who suffers from indigestion. But though we may not enjoin its practice as often as we should, there is not one of us who does not endorse its general desirability in all gastric disturbances. In connection with obesity, however, the importance of due mastication is scarcely accorded even a theoretical recognition. I am nevertheless convinced that disregard of this importance, and consequent insufficiency of mastication, is a very common cause of the ingestion of too much food. The term "insufficient" is, of course, dangerously elastic, and it is therefore necessary to be more precise. It was said of the late Mr. Gladstone that he masticated each mouthful 32 times (once for each tooth), and that he attributed his great mental and bodily vigour largely to this practice. It now appears that this number of 32 is altogether inadequate. In a paper read before the British Medical Association in July, 1901, entitled "Was Luigi Cornaro right?" Mr. Van Sameren states that every mouthful should be masticated until it is both fluid and tasteless. This may seem rather startling, but any one who does this conscientiously during one meal may readily prove for himself that the amount of food which it is possible to take at that meal is immediately reduced by at least one half. There are a great many points of the highest interest and importance in connection with this matter, but I must content myself here with expressing the belief that insufficient mastication leads to the ingestion of a great deal of altogether unnecessary food, and is thus indirectly responsible not only for some cases of obesity, but also for other troubles which are outside the scope of this paper.

But excess, as we know, may also be a matter of quality. The actual amount of food taken may be moderate enough, the excess revealing itself in the relative quantities of fat-forming or fat-saving principles. All the "Systems" for the dietetic treatment of obesity with which the text-books deal so exhaustively¹ are drawn up in the recognition of this central fact. Whether the fats are chiefly attacked, as in Oertel's system, or the carbohydrates, as in Ebstein's, or both fats and carbohydrates, as in

¹ *Food in Health and Disease*, by Dr. Burney Yeo (Cassell and Co.); *Food and the Principles of Dietetics*, by Dr. Robert Hutchison (Edward Arnold).

Banting's and Salisbury's, the main principles are the same, namely, a severe restriction of those proximate principles which are most readily converted into adipose tissue. These are, of course, the starches, sugars, fats, and alcohol, leaving the diet to consist mainly of proteids of animal origin, which are themselves, in most of the systems, reduced much below what is normally necessary to meet the daily output. In connection with these systems, whose efficacy is beyond dispute, it is therefore necessary to remember two things. The first is that if the published quantities in any one of them are strictly adhered to, the patient is not only being starved of fats and carbohydrates, but he is also being severely limited in the whole amount of food taken. The discipline is thus apt to be a very trying one, and may even in some cases give rise to serious weakness. The other is that, such food as is permitted being nitrogenous and drawn almost entirely from the animal kingdom, the treatment is by no means free from the danger of causing grave trouble in the excretory organs, notably the kidneys and the skin. I have known more than one case in which a granular nephritis was determined, even if it was not actually caused, by a too rigorous application of the principles underlying these methods. In the matter of the skin, the experiments of Dr. Chalmers Watson with flesh-fed fowls should warn us that interference with its nutrition during the treatment should be received as an indication that the "system" is not well tolerated.

Let us now consider for a moment the other causative factor in the production of ordinary obesity, namely, inadequate oxidation of the food which is taken. The chief agent in effecting oxidation is admittedly muscular exercise, and where circumstances allow this agent full play, what is called ordinary obesity may be said never to occur. The one part of the body in which fat tends to accumulate despite a very fair average of muscular exertion is the abdomen, and this fact should serve to remind us of what we are too apt to forget, namely, that the effect of muscular contraction in oxidising superfluous adipose tissue is not only general, but local. The deposit takes place in the abdominal wall and intra-abdominally, giving rise to what is called an aldermanic figure, mainly because in the majority of people the abdominal

muscles are very little exercised. In people whose work necessitates the vigorous use of these muscles, boatmen, for example, the aldermanic figure is an exception. Outside such employments it is very rare indeed to examine any one who has well-developed and well-exercised abdominal muscles, and we consequently find this region to be one in which fat deposits itself, so to speak, without fear of disturbance. In the treatment of obesity everyone rightly attaches the utmost importance to exercise, but I venture to say that not enough stress is laid upon the special necessity for securing adequate development of those muscles which cover the abdominal viscera. We have heard enough—more than enough, probably—of the multitudinous miseries which lurk in the “abdominal pool” or the “splanchnic lake,” but there can, I think, be no doubt that conditions which favour undue abdominal venosity are precisely those which conduce to the development of obesity, and undue abdominal venosity is more often caused by relaxed, atrophic, abdominal muscles than by anything else.

It is well to remember that there exist substitutes for ordinary exercise which, when once obesity is established, have many and powerful claims upon our attention. I refer to such means as massage, electricity, Swedish movements and Zander exercises, means which people can seldom be induced to employ while following their ordinary occupations, but to which they will submit with the utmost readiness when away from their everyday surroundings. In the matters both of diet and exercise the health-resort treatment of the condition, provided always that the health-resort is properly selected, holds advantages which cannot be obtained at home.

The part played by the nervous system in oxidising food must be apparent to anyone who has witnessed the extreme degree of emaciation to which mental anxiety may give rise. Some portion of the effect in such cases may be due to the loss of appetite which almost invariably accompanies the anxiety; that it is not wholly due to such a cause, however, is obvious from the fact, familiar to all, that brain-work in the study is even more provocative of hunger than exercise in the open air. The obvious deduction from these considerations is that the patient suffering from obesity should be made actively to employ his mind—a counsel of perfection which is the more

difficult of attainment on account of the mental lethargy which the condition itself begets. It is nevertheless possible to do something in this direction, by taking such a person out of the groove in which he will invariably be found to gyrate, and placing him under conditions where his senses are constantly being roused by things unfamiliar to him and where mental and physical energy is forced upon him.

Here again the health-resort treatment offers very conspicuous advantages. At a foreign station where the language, the customs and the surroundings are all strange, the mind is stimulated to fresh and unaccustomed energies, and the interests are lured beyond the narrow confines of their ordinary channels.

But insufficient oxidation is the result of other and less generally recognised causes than those which we have just considered, causes whose operation gives rise not only to obesity, but to other conditions which are usually ascribed to the artificial lives which town-dwellers are forced to lead. Chief among these is the attitude which the majority of people adopt to that most important organ, the skin. Having regard to the size of this organ and the various functions which it is called upon to perform, it is truly astonishing to observe the insignificant part assigned to it by all existing schemes of personal hygiene. Its influence upon general metabolism is so little considered that the very factor in its usefulness in this direction, namely its power of contracting to cold, is precisely the one which existing customs seek above all things to nullify. It seems to be forgotten in the case of the skin, though it is regarded as axiomatic in the case of all other organs, that disuse gives rise to abeyance or loss of function ; and, instead of the contractile power being educated and cultivated by rational exposure, we see it rendered sluggish and inert by daily hot baths and habitual over-clothing. I should be the last to say anything to disparage the value of hot baths when scientifically employed with a definite end in view, but their daily use for ablutionary purposes by the young and healthy, in that they save oxidation and diminish metabolism, is most undesirable, except when, as so seldom occurs, they are immediately followed by cold affusion and vigorous towelling.

The prevalent vice of over-clothing is more important

because it is so much more general, extending as it does down to almost the lowest grade of hospital patient, and because its consequences to the individual reach much further. For these consequences are seen not only in the obesity and its concomitants to which they contribute in adults, but they are writ large upon the anaemic faces, the ill-developed limbs and contracted chests of the delicate, coddled children, especially of the upper classes. The ridiculous heresy which has given rise to this state of matters is the ignorant fear of what is designated "a chill," a heresy which I fear has been largely fostered by the attachment of the profession to traditional shibboleths. The normal skin of a healthy person is endowed with the power of reacting to cold influences with conspicuous and demonstrable benefit to the organism, and the surest way of depriving it of the power, is to protect it from the influences. Among the many evidences of the responsibility of the profession in this direction is the almost universal recommendation (because, forsooth, it protects from "chill") of woollen underclothing, a material which, as being ill-ventilated and unabsorbent, is of all others the best calculated to induce a relaxed and unresponsive condition of the skin. It would seem necessary to remind the "flannel-enthusiasts" that all warmth comes from the internal oxidising processes, and that it is not in any degree derived from the material worn. Woollen materials are extolled on account of their air-spaces, air being a non-conductor of heat; and if this constituted their main difference from other materials, there might be some ground for the enthusiasm. But it does not. Dry flannel is practically unabsorbent, whereas linen, cotton and silk are, in different degrees, very absorbent. It is possible to imprison air in these materials, but it is quite impossible to render flannel absorbent, except by making it damp; and the above-mentioned enthusiasts would as soon wear a live rattlesnake round their necks as don a garment that was not thoroughly "aired." The result, then, of the practice of wearing flannel under-garments is to imprison a layer of moist and impure air in immediate contact with the skin; the wearer is, in fact, condemned, so far as his cuticle is concerned, to live in a moist climate. Now, all climatologists are aware that not only are moist climates relaxing in their effects, but that in such climates

both heat and cold are most severely felt. There is no heat so oppressive as that of a "muggy" day : no cold so penetrating as that of a foggy day. It follows, therefore, that the consequences of wearing these under-garments are a general lowering of the metabolic processes, oppression in summer, and so sensitive an appreciation of cold in winter, that the number of outer garments worn is grotesquely out of proportion to rational and physiological needs.

Closely associated with this fear of chill in the production of inadequate oxidation is the even more general, and infinitely more pernicious, fear of draughts. This is another heresy from the responsibility for which I fear the profession is not altogether free. To the uninitiated it is difficult to understand what exactly is meant by a "chill." The term is in great request as a cloak for loose diagnosis, but earnest investigation on my part has hitherto failed to elicit anything which could be described as a definition. A draught one understands ; it is the *courant d'air* of the French ; but inasmuch as the gravamen of the charge against it consists in the assertion that it causes a "chill," the position must remain obscure until a definition of the latter is forthcoming.

The popular impression seems to be that chills give rise to nasal, laryngeal, and bronchial catarrhs, and that such chills are more often due to draughts than to anything else. Draughts are therefore guarded against in every possible way. The body is overclothed, rooms are overheated, and fresh air excluded as rigidly as if it were the plague. Catarrhs nevertheless occur with energy and regularity, the victims declaring that they must have caught a chill, though they cannot imagine how. Public opinion demands that draughts shall be excluded from theatres, concert-rooms, public dining-rooms and the like, with the result that nearly all these places are intolerably stuffy and outrageously unwholesome. Members of the medical profession commonly direct that draughts are to be excluded from the sick-room, and so zealously are their orders attended to, that the poor *vis medicatrix naturæ* from which we nowadays demand so much, is expected to make bricks without straw, in combating microbes without oxygen. The natural result of this heretical doctrine and its too willing adoption is that catarrhs and rheums flourish in our midst like a green bay-tree.

For these things are, all of them, or very nearly all of them, microbic in origin, and the policy of the exclusion of draughts affords to the microorganisms exactly the medium which is most favourable to their growth and development. The person who, despite the fact that he returned home in a closed vehicle, muffled up to his eyes in furs, "must have caught a chill coming out of the theatre," does not realise that for three hours he had been inhaling the microbic excreta of other people's air-passages, and that the very "draughts" which he had so piously excluded on his way home, if they had been allowed free play, would probably have killed some of the germs and so proved his salvation.

I have often put it to people, sometimes in railway carriages, that it is a disgusting thing to breathe air which has passed through the lungs of others. The senses recoil at the bare suggestion of utilising, in any dilution, material which has passed through any other internal organ. Nevertheless, the lungs being excretory organs, the analogy, however unpleasant, wants nothing in completeness. The open-air treatment of phthisis has done something towards the purging of this monstrous and destructive heresy; but the leaven works slowly, and the man in the street insists upon regarding the open-air system rather as a trying discipline properly reserved for the tuberculous, than as a measure of general hygiene, prophylactic as well as curative.

The bearing of these considerations upon obesity and other states of sub-oxidation or deficient metabolism is sufficiently obvious. To the proper elaboration of any metabolic process oxygen is essential, and it is evident that no such process can work smoothly and efficiently if the stream of necessary oxygen is attenuated and polluted at its source. If the ignorant fear of draughts, with all its disabling consequences, is to be stamped out, the gospel of the absolute necessity for abundance of fresh air must be preached vigorously and with determination, not to the tuberculous only, but also to those who, like the gouty and the obese, are the victims of perverted or insufficient metabolism.

But unhampered and augmented oxidation, even when combined with suitable dietetic regulation, is effectual only when supplemented by efficient excretion. The products of

combustion, if not promptly removed, become a potent source of evil. And here again we are reminded of the necessity for paying due attention to the activities of the skin and lungs, as well as to those of the bowels and kidneys. The excretory function of the skin is one which is even more important, as it is certainly less considered, than its heat-regulating function, and it is seldom indeed that, except at health-resorts, any serious attention is paid to it. The lungs, as I have endeavoured to show, are not encouraged by prevailing customs to render any assistance in this matter ; but it may be confidently asserted that practitioners at health-resorts are more alive than their brethren in large towns to the beneficent effects of the open air and sunshine in all morbid states.

Patients sometimes think that the mere drinking of some "natural mineral water" will cure them of obesity, and the mistake may be excused when we recall the great reputation which is enjoyed by Carlsbad, Marienbad, Homburg, Kissingen, Brides-les-bains and others, in the treatment of the condition. In so far as the waters themselves at these places are helpful, they are so in virtue of their effects upon the bowels and kidneys when taken internally, and of their action on the skin when administered in baths. They have no specific action upon adipose tissue, and the resorts owe their just claim to recognition largely to the attention paid by their physicians to other details, and mainly to the readiness with which patients will attend to instructions.

Another method of treating obesity which is much in vogue at present is that by thyroid extract. Unfortunately the lazy and well-to-do among the public are well acquainted with its powers in this direction ; and as it can be obtained across the counter, the rôle of the physician in connection with it is generally that of detecting the fact of its surreptitious use. Like some of the drastic dietetic systems, it is certainly efficacious in most instances, but it has this further resemblance to them, that its use is by no means unattended by danger. The restlessness and tachycardia to which it is liable to give rise often persist for long periods after the drug is withheld. It constitutes a means of augmenting metabolism ; but unless its exhibition is carefully supervised and associated with the other details of management and hygiene to which I have referred,

though it may reduce the obesity, it will probably give rise to other difficulties in comparison with which obesity might well be regarded as an ornament.

It was my intention to refer to some other aspects of this question, such as hereditary obesity, and the condition which Mr. Jonathan Hutchison has described under the name of Lipomatosis Universalis Asexualis, but the consideration of these and other interesting matters must be deferred to a future communication



THE NUCLEUS IN MALIGNANT NEOPLASMS.

By PETER PATERSON, M.B., M.R.C.S.,
Assistant Professor of Surgery, Glasgow University.

[With Plates XVIII.—XXI.]

THE following observations on the behaviour of the nucleus in malignant tumours may be of some interest at the present time, when so much consideration is being directed to this part of the cell. The writer's attention was first drawn to this subject by noticing the peculiar appearances presented by many of the nuclei in a carcinoma of the kidney, in which, owing to the protoplasm of the tumour-cells having undergone a colloid change, the tissue was specially suited for observations on the nucleus. Examination of many cancers and sarcomas, removed from various regions of the body, has revealed phenomena of a similar nature ; and though in many of these cases the peculiarities could only be made out with difficulty owing to the close arrangement of the cells, still by careful preparation and staining of the tissues they could be observed.

Sections from these tumours show a number of nuclei throwing out processes like pseudopodia. In some cases these projections are the first stage in the formation of daughter-cells by budding (Fig. 1, *a*, *b*, *c*), but in others they are the beginning of a migration of the nucleus from its cell. Such a process reaches the cell-wall, through which it forces its way (Fig. 2, *a*, *b*, *c*), and gradually the whole nucleus follows (Fig. 3), thus leaving the cell without a nucleus, if it only contained one originally, though a considerable number of the cells possess two, derived usually from the primary nucleus by budding or fission. This wandering body is then found either in an adjacent cell or among the supporting fibrous structure of the tumour, where it may produce daughter-nuclei and become the centre of a new cell-formation, or it may coalesce with another similar nucleus. Such a coalescence takes place either directly (Fig. 4, *a* and *b*), or by means of a long process (Fig. 5, *a* and *b*), and the two then form a large deeply-staining nucleus (Fig. 6, *a* and *b*). Occasionally

several nuclei fuse, and thus a large mass of nuclear matter is found (Fig. 7, *a* and *b*), from which daughter-nuclei are set free by budding or fission. Coincident with these phenomena other nuclei are proliferating by mitosis ; and though a large number of these are apparently doing so by the usual process, a few are evidently deviating from the normal. These latter, when about to divide, extrude a small part of their chromatin-substance. The extracted portion lies, at first, in the immediate vicinity of the dividing nucleus, but gradually becomes separated from it, and has even been observed lying outside the cell (Fig. 8, *a*, *b*, *c*). This piece of chromatin, cut off from the body of the nucleus, may grow till it resembles a lymphocyte in size, but beyond this the writer has not been able to follow it. The other part may then go on to divide by mitosis, but with a diminished number of chromatin-filaments (Fig. 9). Whether those nuclei which have lost part of their chromatin, at some period of their life-history, continue to proliferate in this irregular manner, or whether they constitute the wandering bodies which ultimately coalesce with other nuclei, has not been definitely ascertained ; but Fig. 10 would almost suggest that the latter is the course pursued. In this photograph a comparatively large mass of chromatin is seen in the resting-stage, whilst the other part of the nuclear substance is sending out a long process which is evidently fusing with a neighbouring nucleus.

It would almost seem as if the processes involved were analogous to the formation of polar bodies and the union of sexual elements, but in the case of malignant tumours the resulting nuclei are only able to reproduce cells similar to those from which they originated.

The phenomenon above described can be observed, more or less, throughout the tumour-mass ; but if a part is examined, either at the margin of the neoplasm, or preferably some distance from the edge, as in a separate acinus in cancer of the breast, the epithelium can be seen proliferating, almost entirely by budding, whilst mitosis is practically absent (Fig. 11). In fact the appearances are the same as those seen in the cells of simple inflammatory exudates and in the epithelium covering the cornea in inflammatory conditions of the eye. The writer believes that at this stage the action is a simple inflammatory

PLATE XVIII.



Fig. 1 *a.*



Fig. 1 *b.*



Fig. 1 *c.*



Fig. 2 *a.*



Fig. 2 *b.*



Fig. 2 *c.*

PLATE XIX.

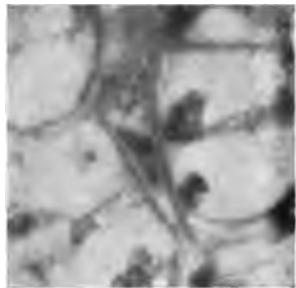


Fig. 3.



Fig. 4 a.



Fig. 4 b.



Fig. 5 a.



Fig. 5 b.



Fig. 6 a.

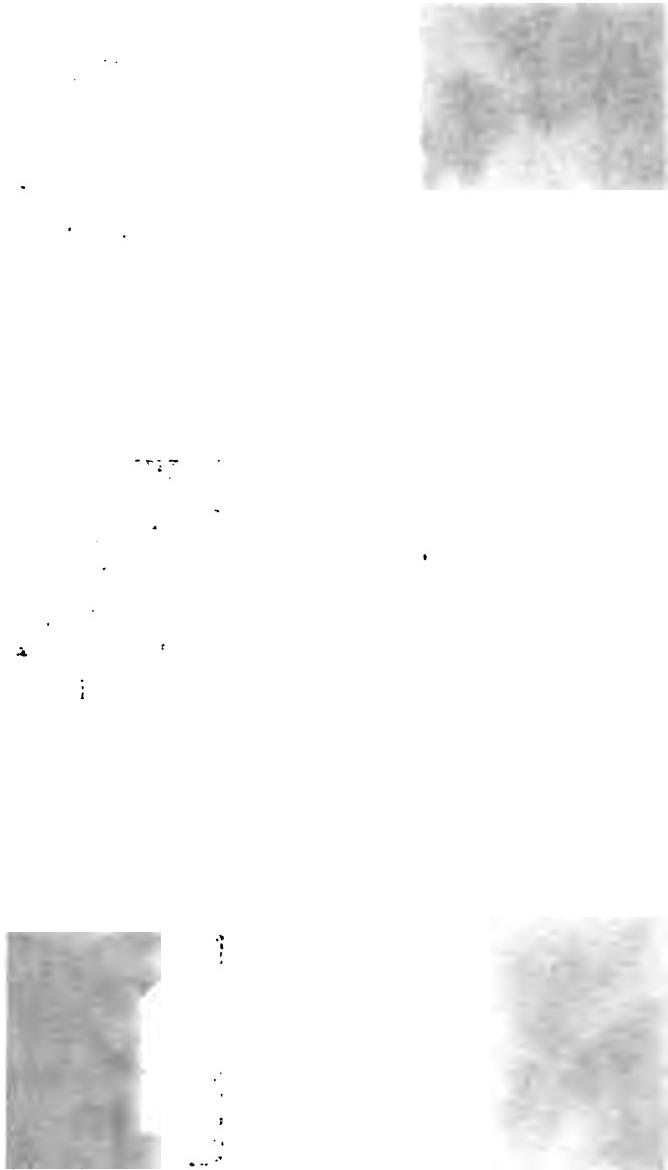


Fig. 8 *L.*

FIG. XIX.

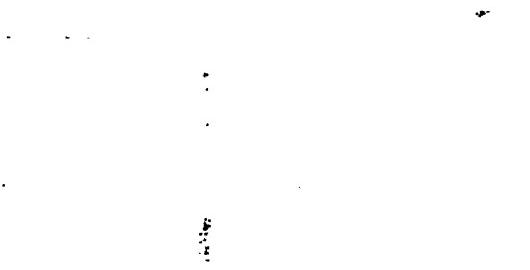


Fig. 2.

Fig. 3.

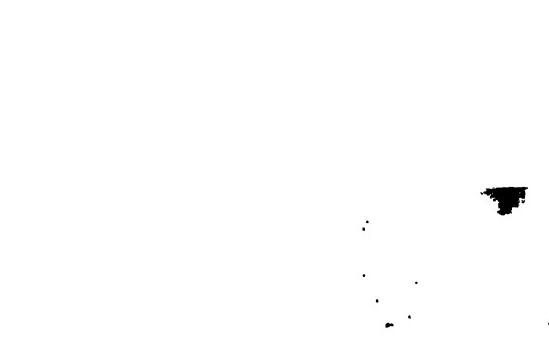


Fig. 4.

Fig. 5.

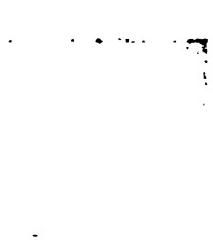


Fig. 6.

PLATE XX.



Fig. 6 *b.*



Fig. 7 *a.*



Fig. 7 *b.*



Fig. 8 *a.*



Fig. 8 *b.*



Fig. 8 *c.*

PLATE XXI.



Fig. 9.

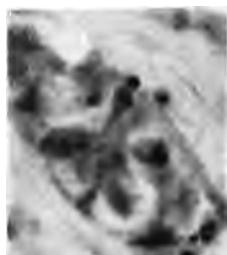


Fig. 10.

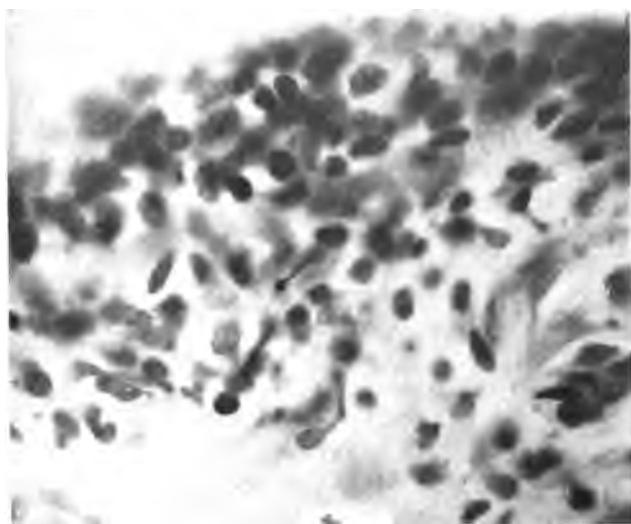


Fig. 11.

one, and that if the irritation subsided, the nuclei would return to their normal condition ; but should the stimulation be continued, the above-sketched series of changes are initiated, and the process becomes malignant.

Metastasis may be explained by nuclei, which have undergone this change and possess this power, having been transferred to other parts and repeating the process in their new surroundings. As to what may be the exciting cause of this alteration in the character of the nuclei, the writer can offer no definite opinion, but it seems more of a histological than of a bacterial nature.

EXPLANATION OF PHOTOGRAPHS.

Fig. 1. *a. Nucleus multiplying by budding (Cancer of breast).*

„ b. A more advanced stage of the same (Cancer of breast).

„ c. A still more advanced stage. A daughter-nucleus has just been set free (Cancer of kidney).

Fig. 2. *a. A nucleus sending out a blunt protrusion which has perforated the cell-wall (Cancer of kidney).*

„ b. The same as a. The nucleus is almost free of its cell (Cancer of kidney).

„ c. A nucleus, which has produced two daughter-nuclei, leaving its cell (Secondary deposit in a gland).

Fig. 3. *A nucleus almost completely through the cell-wall. The latter is lying obliquely to the surface and part of it is seen as a fine band passing over the nucleus (Cancer of kidney).*

Fig. 4. *a. Two nuclei uniting (Cancer of kidney).*

„ b. Union of two nuclei. One has a short process which is producing an indentation, in the other at the point of contact (Cancer of breast).

Fig. 5. *a. Two nuclei uniting by means of long projections. The point of contact is marked by a small nodule (Secondary cancer in a gland).*

„ b. Two nuclei coalescing. One nucleus is distinctly indented by a process from the other one.

Fig. 6. *a. Two nuclei which have partly coalesced. The fused part is deeply stained (Cancer of breast).*

„ b. The same (Cancer of kidney).

- Fig. 7. a. A large irregular nucleus produced by the fusion of a number of nuclei. In the case of one, union is not complete (Cancer of kidney).
,, b. A large mass of chromatin substance (Cancer of kidney).
- Fig. 8. a. A dividing nucleus which has extracted a small part of its chromatin (Cancer of breast).
,, b. The same. The extruded chromatin is larger than in "a" and lies further from the nucleus (Cancer of breast).
,, c. The same with the discarded chromatin lying outside the cell (Cancer of breast).
- Fig. 9. A nucleus undergoing irregular mitosis, with a large piece of chromatin at its side (Cancer of breast).
- Fig. 10. A nucleus, which has cast off a large piece of chromatin, coalescing with another nucleus, by means of a long process (Cancer of breast). Owing to the nuclei not being in the same focus, the receiving nucleus and part of the process are not well defined.
- Fig. 11. Part of an acinus in the immediate vicinity of a carcinoma of the breast. The epithelium is proliferating by budding.



THE MALIGNANCY OF SOME APPARENTLY BENIGN OVARIAN CYSTS.

By FRANK E. TAYLOR, M.Sc., M.A., M.B. (VICT.), F.R.C.S. (ENG.).

Pathologist to the Chelsea Hospital for Women, London.

IN the April number of THE PRACTITIONER Dr. Alcock relates an interesting case of sarcomatosis of the peritoneum which terminated fatally nine months after the performance of ovariectomy for a ruptured ovarian cyst which at the time of removal appeared on naked-eye examination to be an ordinary benign cystadenoma, without the slightest suspicion of any malignant characters. That a seemingly-benign ovarian cyst may in reality be a malignant new growth—either a cystosarcoma or a cysto-carcinoma—is unhappily a fact which, although distinctly recognised, is apt to be overlooked. It may be, and probably is, a more common occurrence than is usually supposed.

It is a striking fact that the late Sir Spencer Wells found that malignant disease contributed 36 per cent. to the known causes of death in patients who had recovered from the operation of removal of one or both ovaries. Mr. Roger Williams,¹ who pointed out this fact, examined the records of the after-histories of 1,000 completed ovariectomies performed by Sir Spencer Wells, and puts the matter very forcibly when he states that he found "that of those who recovered after completed ovariectomy 117 have since died, the cause of death being unknown in 29; of the remaining 88 no less than 32 had succumbed to malignant disease, or 1 in 2·75. During the same period I have ascertained that the cancer mortality in the general population among women of the same age was 1 in 15. Thus the cancer mortality was nearly 5½ times greater for those whose ovaries had been removed than for those who had undergone no such operation. Moreover, the proportion of cancer deaths was much greater among those who had undergone double ovariectomy than in those submitted to the unilateral operation."

¹ *The Lancet*, November 28, 1903, p. 1530.

By means of a careful microscopic examination of the tumour removed at operation the precise nature of an ovarian cystoma may be ascertained ; the malignancy in the first case reported below being discovered by microscopic examination alone (the time which has elapsed since operation being as yet too short to know what the ultimate result will be), and in the second both by the microscopic examination and by the after-history of the case.

Case 1.—S. W., a married woman, aged 50, sterile, was admitted on March 15th, 1904, into Chelsea Hospital for Women under the care of Dr. W. H. Fenton (by whose kind permission I am able to record this case). She complained of pain in, and swelling of, the abdomen. The swelling was first noticed eight months before admission, in the left iliac region, and it gradually increased in size. Menstruation was regular and normal until three years ago. From that time until April, 1903, the menstrual periods only occurred once in six months. From April to August, 1903, they occurred every four weeks, and the loss was profuse and offensive. From then until February, 1904, the periods recurred every fourteen days, and the loss was very small in amount, watery, and very offensive. For five weeks before admission into hospital there was a constant watery yellow discharge, and the patient had much abdominal pain, sharp and lancinating in character, severe enough to cause nausea. For seven days the pain had occurred periodically at 4 p.m. each day. Micturition was frequent, especially at night, when the patient had to get up every two or three hours. The bowels were regular. She had suffered from rheumatism and lumbago for many years.

Examination revealed a systolic murmur at the apex ; the lungs were normal ; and the temperature reached 100° F. once before operation.

The abdomen was occupied by a rounded swelling occupying the middle line and reaching upwards nearly as far as the umbilicus. It was dull on percussion, and there was resonance in both flanks. No fluctuation could be elicited.

Per vaginam the cervix was pushed downwards and forwards, and the abdominal swelling could be felt to be in contact with the uterus, which was freely movable and not enlarged.

Diagnosis.—Multilocular cystic ovarian tumour.

Operation.—On March 18th, Dr. Fenton performed a coeliotomy. On opening the peritoneal cavity the tumour was found to be a left ovarian cyst. It was adherent to bowel and omentum, and was embedded behind and under the left broad ligament. The adhesions were separated with some difficulty, and the pedicle was transfixated and doubly ligatured, and the tumour removed. There was no ascites. The wound was closed in three layers and a gauze-drain inserted.

Pathological Report.—The tumour was received by me in the pathological laboratory the same day, and I reported as follows :—"The growth is a multilocular ovarian cyst the size of a foetal head. The walls are everywhere smooth and shining externally, with no papillary growths. On cutting into the cyst brownish colloid semi-fluid substance escaped. The cyst-wall was found to be of very varying thickness in different parts, being thin, membranous, and translucent in places, and again thick and fleshy in others."

There was nothing in these appearances, therefore, to distinguish the tumour from an innocent multilocular ovarian cystadenoma. A portion of the thick fleshy part of the wall was taken for microscopic examination, and this gave all the appearances of a glandular carcinoma.

Case 2.—Dr. Inglis Parsons has already communicated the history of this case to the Obstetrical Society of London, and there shown sections of the growth. It bears a strong resemblance, however, to Dr. Alcock's case, and was so recently investigated pathologically by myself that I would again allude to it.

M. E. B., a married woman, aged 33, was admitted into Chelsea Hospital for Women on May 1, 1902, complaining of swelling in the abdomen. She had had one child seven years ago, and one miscarriage at four months in June, 1901. Menstruation had been regular until a month ago ; since then there had been irregular losses.

The swelling in the abdomen was first noticed in June, 1901. For four months before admission into hospital there had been some pain in the abdomen on sudden movement, and also some pain on passing water. The bowels were confined.

Examination revealed a mitral systolic murmur. The lungs

were healthy. The temperature was $101\cdot2^{\circ}$. The abdomen was occupied by a large, rounded, irregular swelling, extending up to the ribs, most prominent below the umbilicus. It was dull on percussion. No fluctuation or thrill could be made out. Both flanks were resonant. The tumour felt hard in some parts, but elastic in others. *Per vaginam* the uterus was found retro-displaced, but not enlarged. The cervix was firm, and there was no blueness of the vagina.

Diagnosis.—Multilocular ovarian tumour.

Operation.—Ovariotomy was performed under ether on May 9, 1902. The tumour presented the appearance usually seen in a multilocular ovarian cystadenoma. Some of the cysts were tapped, but the contents were too gelatinous to flow, and a large incision had to be made to deliver the tumour whole. There was no ascites, and only a few adhesions to omentum, which were tied up. The pedicle was rather thick and more fleshy than usual, but was tied in two parts by an interlocking ligature. The tumour was found to spring from the left ovary.

The right ovary was normal in size, but bound down by recent adhesions. These were separated, the ovary freed and left in the pelvis. The wound was sown up in three layers.

Pathological report.—After an examination of the tumour I wrote the following report:—"The tumour is a large multilocular ovarian adenomatous cyst, containing seven pints of red grumous colloid fluid. The exterior of the cyst-wall, though quite smooth, is lumpy and tuberose. The interior of all the cysts is smooth and glistening and free from papillomatous growths. The thickness of the cyst-wall varies much, in some places being thin and membranous, in others half an inch thick and fleshy. The contents of the cyst varied much in consistency and colour, some being grey and very viscid, some dark-red and more fluid."

Here again the microscopic examination of the tumour gave rise to no suspicion of the malignant nature of the cyst. A portion of the thick fleshy part of the cyst-wall was, however, submitted to microscopic examination, which revealed a mixed round- and spindle-celled sarcoma.

The patient's temperature, which had touched 102° F. just before operation, fell to normal the same day, and remained so for fourteen days. The large incision united by primary union, and

the stitches were removed on the sixth day. So far the patient had made an uninterrupted recovery. On the fifteenth day she complained of pain, and the resident medical officer, Dr. W. Darling, noticed some swelling in the left iliac region, and also behind and to the left of the uterus. The temperature rose to $100\cdot 4^{\circ}$. The patient's general condition remained good. The swelling, however, continued to increase, but no rigors occurred, and the temperature did not rise above $100\cdot 4^{\circ}$, so Dr. Parsons concluded that there was no pus present, although it was thought that there was some inflammatory effusion into the pelvis. The suspicion had never been entertained that this might be a recurrence of the growth.

By June 4, twenty-six days after operation, as the patient's condition was getting desperate, the abdomen was reopened. A huge mass of new growth was found extending up from the pelvis to the abdominal wall and matting everything together. The patient died the next day. Sixty hours after death I performed a partial post-mortem examination, being only allowed to examine the abdomen, and found the following conditions :—

The body is well nourished, with much abdominal distension. There is an abdominal incision reaching from two inches above the umbilicus to just above the pubic symphysis, which is well healed, except for a small opening in the middle, where there is a sinus containing a gauze-drain. On opening the abdomen in the middle line a large quantity of yellow thin fluid escaped, followed by reddish-brown blood-stained fluid, several pints in all.

The incision in the lower half of the abdomen led straight into a thick mass of growth in the peritoneum. On cutting through this, the whole pelvis and the greater part of the abdomen were found to be occupied by similar growths, in which were embedded the uterus, the ureters, and the greater part of the omentum and intestines. The uterine appendages could not be recognised. There was also a large mass of growth in the glands along the front of the lumbar spine. It was with great difficulty that the mass could be removed. There were small masses of secondary growth in the liver and spleen. The kidneys were both much enlarged, and showed dilated calices ; they were also soft and easily lacerated. The ureters were much distended.

Microscopic examination of the secondary growths presented precisely the same appearances as those of the primary ovarian tumour, viz., mixed round- and spindle-celled sarcoma.

The lessons to be drawn from the consideration of these and other cases, including that of Dr. Alcock, may thus be briefly enumerated :—

1. It is impossible by mere macroscopic examination to distinguish between benign and malignant ovarian cysts. Every ovarian cyst should be submitted to microscopical examination to determine its precise nature and give accuracy and precision both to diagnosis and prognosis.

2. Every ovarian cyst should be submitted to operation and removed with the least possible delay after its discovery, because of the uncertainty of its nature.

3. Ovarian cysts should invariably be removed entire, without being tapped or punctured, the abdominal incision being prolonged to the necessary extent. The risk of sowing malignant cells broadcast and implanting them on the peritoneal surface, where they may proliferate luxuriantly, is thereby avoided.

4. During the operation of ovariotomy the ovarian pedicle should be ligatured and cut through as near the uterus—that is to say, as far away from the diseased tissues—as possible. Nothing in the nature of conservative surgery is permissible in dealing with ovarian cysts.



A REVIEW OF SOME RECENT OBSERVATIONS ON GASTRIC AFFECTIONS.

By H. D. ROLLESTON, M.A., M.D., F.R.C.P.,

Physician to St. George's Hospital.

RECURRENT VOMITING IN CHILDREN.

THE nature of cyclical, periodical, or recurrent vomiting in children has been commonly supposed to be either a neurosis or a manifestation of the "uric acid" or gouty diathesis. Edsall,¹ who has specially worked at "acidosis" or acid intoxication, brings forward five cases in children of recurrent vomiting, in which there was at the time of the attacks, but not in the intervals, a severe acid intoxication of the type seen in diabetes mellitus and occasionally in other conditions, such as carcinoma, grave anaemia, infectious diseases and gastrointestinal disturbances. In Edsall's cases the urine was found to contain diacetic acid and acetone, when the prodromal symptoms of cyclical vomiting were coming on. The acid intoxication appeared to be the chief factor in producing the violent vomiting, since the immediate administration of large quantities of bicarbonate of soda (125 grains in divided doses) prevented imminent attacks. Though the cause of acidosis is not as yet definitely known, there are probably two varieties, (i.) a primary disturbance of metabolism; (ii.) that primarily due to digestive disturbance, which is perhaps intensified by perversions of metabolism. It seems very likely that in many cases of recurrent vomiting and perhaps in all that show acid intoxication, the primary disturbance lies in the digestive tract. Marfan² attributed recurrent vomiting to acetonæmia; but Edsall, while believing that Marfan's cases confirm the theory that cyclical vomiting is due to acidosis, considers Marfan's interpretation as incorrect, on the grounds that (*a*) acetone itself is not the cause of the toxic symptoms in the form of intoxication in which it appears in the urine; and (*b*) that it

¹ *American Jour. Med. Sciences*, Vol. CXXV., p. 629.

² *Archiv. de Méd. des Enfants*, 1901.

is very questionable whether acetone, as such, ever exists in the blood.

HYPERRÆSTHESIA OF THE STOMACH.

As a primary disorder, gastric hyperæsthesia has attracted very little attention, and its symptoms are usually attributed either to ulceration of the stomach or to gastritis. This is the opening statement in a clinical account of the condition given by Dr. Soltau Fenwick.¹ It is described under the Sensory Neuroses of the Stomach by Einhorn and by Osler; but since it is very probable that it is often regarded as an organic affection, it will be well to consider Dr. Fenwick's description in some detail. It may appear in the course of nervous affections such as cerebral tumour, meningitis, tabes, neurasthenia, and hysteria; and in women from the effects of prolonged lactation, menorrhagia or excessive leucorrhœa; while in men sexual excess, masturbation, mental strain, and even the abuse of tobacco may be responsible for it. Occasionally direct irritation of the gastric nerves by alcohol, coffee, ice, or drugs, such as salicylates, quinine, or iodides, may cause it. But the most important factor is chlorosis in young women, so that the resemblance to early gastric ulcer must naturally arise. The two most prominent symptoms are pain and vomiting. In its typical form the disease has four stages. In the first each meal is followed by fulness and discomfort which start in the epigastrium and left hypochondrium, and culminate in an aching or burning sensation radiating to the chest. There is flatulence, followed by nausea, and usually constipation. In the second stage there is genuine pain in place of the mere discomfort in the previous stage; it comes on directly after any kind of food, but is specially severe after solid food. The third stage is characterised by the appearance of vomiting, at first only occasionally, but subsequently after every meal. The pain, unlike that of ulcer, is not relieved by vomiting; while there is no emaciation, and the appetite remains good. In the fourth stage the general nutrition fails, and if the case comes under observation then for the first time, the diagnosis is difficult. Vomiting follows ingestion

¹ *Clinical Jour.*, Vol. XXIII., p. 296, February 24, 1904.

of food so rapidly that the pain previously felt disappears. The physical examination of these cases shows that there is cutaneous hyperæsthesia in two-thirds of the cases, the symptoms thus differing from those of ulcer where it is rare; tenderness is present over the whole of the stomach, and is never localised. The gastric contents are normal in 60 per cent., deficient in hydrochloric acid in 10 per cent., and show moderate hyperchlorhydria in 30 per cent. In the diagnosis from gastric ulcer it should be remembered that, in addition to the points already mentioned, pain rarely occurs until after the completion of a meal in ulcer, and, unless the ulcer is near the oesophagus, never immediately after swallowing a mouthful of food, while the pain is at once relieved by milk and the tenderness is strictly localised. Vomiting is less frequent in ulcer, and by emptying the stomach at once removes the pain. Rest in bed and milk-diet rapidly relieve the symptoms of ulcer, but produce little effect in gastric hyperæsthesia, and indeed usually aggravate its manifestations. In chronic gastritis, which is rare in young women, apart from alcoholism, cardiac disease, pulmonary tuberculosis and chronic nephritis, pain comes on an hour after food, the vomit contains mucus, and is usually deficient in hydrochloric acid. The treatment of gastric hyperæsthesia is in its main particulars the exact reverse of that of ulcer. Soft foods rather than liquids are advisable, with, as soon as the symptoms permit, a return to an ordinary mixed diet. The medicinal treatment should be solely directed to curing the anaemia and the constipation, gastric sedatives and stomachics being valueless and enemata often harmful.

"MICROGASTRIE PRIMITIVE."

Although a capacity of more than 1,700 c.c. is usually regarded as evidence of dilatation of the stomach, this limit may be exceeded without there being any real dilatation, and conversely the capacity of the stomach may be markedly diminished in starvation, &c. According to Bendersky of Kiew, whose views are summarised in *La Semaine Médicale* of March 23, 1904 (p. 92), the stomach may be abnormally small, as a primary condition, from a partial failure in development. This condition—termed *microgastrie primitive*—is analogous to an infantile uterus, and is not a mere anatomical

curiosity, but gives rise to a series of morbid phenomena, and therefore requires clinical recognition. It is usually seen in women, and is detected by finding the inferior border of the stomach at an abnormally high level in the abdomen ; and further, it can be rapidly recognised by the presence of a horizontal furrow, due to the strings of the underclothes, at the level of the lower border of the stomach. The patients naturally cannot take as much food as individuals with normal stomachs, and any dietetic error gives rise to more or less painful sensations, feelings of weight, eructations, &c. The most characteristic symptom, however, is frequent vomiting, repeated twenty or more times a day, resembling nervous vomiting, without any nausea, and sometimes accompanied by obstinate hiccup. The treatment is naturally directed to restricting the diet, meals being small and at frequent intervals. The gastric irritability may be systematically treated by gastric douches.

GASTROPTOSIS.

Gastrophtosis may occur as a primary lesion, as shown by the fact that downward displacement of the pylorus is the only visceral lesion present to account for well-defined gastric symptoms, while in other cases gastrophtosis may exist without any symptoms at all. "To what extent is gastrophtosis responsible for symptoms ?" is one of the questions which Dutton Steele and Francine¹ discuss in a continuation of their investigations on this condition. Certain cases of gastrophtosis are relieved so promptly and so decidedly by external mechanical support alone that the downward displacement of the pylorus must be regarded as the primary, or at least the principal, factor in the causation of the symptom-complex. Cases of this kind showed a moderate diminution of hydrochloric acid in the gastric juice, were free from organic disease, and presented no sign of dilatation or impaired motility of the stomach. The symptoms were those of malnutrition, gastric fermentation, frontal headache, and a feeling of dragging and want of support in the abdomen. In other instances gastrophtosis is a complication of definite morbid conditions and not a primary change ; that it is a complication of considerable importance is shown

¹ *Univ. of Penna. Medical Bull.*, December, 1903, p. 35.

by the benefit and comfort derived from mechanical support. The treatment of cases of primary gastroptosis consisted in external mechanical support, and the diet usually given in such cases ; and as many of the patients had been on this diet for some months without improvement, the mechanical support was clearly the direct cause of improvement.

Effectual mechanical support, applied even over long periods, does not restore the stomach permanently to its normal position. This was shown by reëxamination of 18 cases after the belt had been worn for an average period of 17 months. In two cases, however, the belt was discarded without return of symptoms ; the mechanical support having apparently produced some changes—probably compensatory in character—in the stomach, which enabled it to perform its functions satisfactorily, although displacement still persisted. Surgical measures are indicated in primary gastroptosis by two contingencies :—(i.) when the patient's social condition renders a long period of treatment impossible ; (ii.) when prolonged observation shows that external support cannot be discarded without a return of symptoms.

HOUR-GLASS STOMACH.

This condition was formerly a pathological curiosity, and was often regarded as a congenital malformation, or as a reversion to the condition found in some animals. The advance of abdominal surgery, however, has shown that this morbid condition is by no means a rarity. Thus Mayo Robson¹ has had personal experience of operations on twenty-three, and Moynihan² on eighteen cases. The view formerly accepted that some of the cases were congenital has been vigorously opposed, especially by Moynihan, who in a recent review of the subject says that, as far as he is aware, there is not a single specimen nor an accurate record in existence which can be accepted as evidence of the congenital origin. He points out that the appearance of hour-glass deformity may be mimicked with remarkable accuracy by dilatation of the stomach and upper part of the duodenum, as a result of congenital narrowing of the duodenum near the biliary papilla, the pylorus simulating the isthmus

¹ *Lancet*, 1904, Vol. I., p. 5.

² *Medico-Chirurg. Trans.*, Vol. LXXXVII.; *Lancet*, 1904, Vol. I., p. 298.

between the two pouches. Both these writers agree that hour-glass deformity of the stomach owes its origin to the following definite organic causes :—(i.) Perigastric adhesions due to many factors, but most commonly gastric ulcer or cholelithiasis ; (ii.) chronic ulcer : this may produce the condition in two ways, by cicatricial contraction, or by fixing the stomach to the anterior abdominal wall or posteriorly to the pancreas ; the pouches on each side, but especially towards the cardiac end, then tend to sag, and this with the cicatricial contraction taking place in the ulcer results in the hour-glass form of the stomach ; (iii.) malignant disease. Dwight,¹ while opposing the congenital origin of the hour-glass stomach, does not admit that it is necessarily due to organic disease. His view is as follows :—Normally “rings of contraction” in the muscular coat of the stomach occur, and their effect on the organ may be seen when it is examined shortly after death, as pointed out in 1807 by Sir Everard Home and subsequently by Struthers. If this contraction becomes chronic, the bilocular stomach may result. Moynihan, who has watched these constantly-recurring attacks of spasm during operations, believes that this factor is, when combined with cicatricial contraction, of great importance in determining the narrowing of the stomach. The existence of hour-glass stomach can be diagnosed by means of special tests which are as follows [Moynihan] :—(i.) when the stomach is washed out with water there is a definite loss, from the escape of some of the fluid into the distal pouch (Wölfler's first sign) ; (ii.) when the stomach is washed out so that the washing is quite clear, a sudden rush of offensive fluid comes from the pyloric pouch (Wölfler's second sign) ; (iii.) when the stomach is palpated and a succussion-splash obtained, washing out the stomach so that it is apparently empty does not prevent succussion, which is produced in the pyloric pouch (Saworski's paradoxical dilatation) ; (iv.) after distending the stomach with gas, the swelling is first limited to the left side, and then gradually passes to the right side of the abdomen ; (v.) a “sizzling” sound (Von Eiselberg) is heard by the stethoscope over the stomach after distension with gas by means of a Seidlitz powder given in two instalments ; (vi.) after percussion and estimation of the stomach-resonance, a Seidlitz powder in two

¹ *American Jour. Med. Sciences*, Vol. CXXVI., p. 581.

halves is given, and enormous increase in the resonance of the upper part of the stomach follows, while the lower part remains unaltered; on watching the abdomen for a few minutes the pyloric pouch may sometimes be seen to dilate gradually; (vii.) under these same conditions a sulus can sometimes be seen between the two pouches.

ADHESIVE ANTERIOR PERIGASTRITIS.

As the result of gastric ulcer, peritoneal inflammation and adhesions may give rise to symptoms of importance, and may imitate other conditions, especially carcinoma of the stomach. Duplant¹ has specially studied this form of perigastritis on the anterior surface of the stomach. There are two types of anterior adhesive perigastritis.

(1) Near the pylorus—prepyloric adhesive perigastritis, due to an ulcer near the pylorus. This is not very common; in 17 cases of anterior adhesive perigastritis, four were of this variety. There is usually stenosis of the pylorus, and there may be jaundice. When the inflammatory adhesions form a definite tumour, the resemblance to carcinoma of the pylorus is very close; and in these cases the diagnosis must be made on the history, the existence of growths in the liver, enlarged supraclavicular glands, &c. It is important to draw a distinction between (*a*) peripyloric adhesions due to ulcer, and (*b*) pyloric stenosis of biliary origin, viz., due to cicatricial contraction of adhesions set up by cholecystitis and peri-cholecystitis, which is a much commoner affection. A history of cholelithiasis or of bilious vomiting on the one hand, or of haematemesis on the other, is significant. The importance of diagnosis between these two conditions lies in the fact that the operative treatment differs: in the case of pyloric stenosis of biliary origin separation of the adhesions and removal of biliary calculi is necessary; while in pyloric perigastritis due to ulcer, gastro-enterostomy is required, and division of the adhesions does no good and may even do harm.

(2) Near the cardiac end of the stomach — precardiac adhesive perigastritis due to ulcer is commoner than the first form, being met with in 13 out of 17 cases. It is not accompanied by pyloric stenosis or gastric dilatation, but may

¹ *Rev. de Méd.*, 1903, p. 634.

produce the hour-glass deformity of the stomach. It is difficult to differentiate the symptoms from those of ulcer ; they usually become manifest years after the ulcer, but they may come on after a short interval, in which case there is a localised abscess. The pain of gastric ulcer generally radiates to the back, while the pain of adhesive perigastritis extends to the shoulder or to the left mammary region and does not go below the umbilicus. The patients may walk with a stoop, or lie curled up in bed. Exacerbations of pain with increase in size of the tumour and fever may occur, and are due to the peritonitis and not to the underlying ulcer. The amount of hydrochloric acid in the gastric juices may be diminished, or at an early stage, when peritonitis is going on, may be increased, but only to a slight extent. The important physical sign is the presence of a hard mass, which may be adherent to, and continuous with, the edge of the left lobe of the liver ; it must then be distinguished from a secondary growth in the liver, which, however, is never strictly limited to the inferior margin of the left lobe. The tumour must also be distinguished from carcinoma of the cardiac end of the stomach, which is usually near the lesser curvature, more deeply seated, and is prone to obstruct the cardiac orifice. Perigastritis combined with and due to gastric carcinoma is rare.

Medical treatment is much on the same lines as in ulcer, with cold applications locally. When exacerbations and pain recur, in spite of medical treatment, surgical intervention is called for. Mere division of the adhesions may not be sufficient, as they may return and may then interfere with a subsequent gastro-enterostomy. Since an ulcer is also present and the surgical treatment of ulcer is gastro-enterostomy, the adhesions should be first divided and gastro-enterostomy then performed.

PHLEGMONOUS GASTRITIS.

Phlegmonous gastritis, or suppurative inflammation of the wall, especially the submucous coat, of the stomach has been described under a number of names, such as "linitis suppurativa," but is usually known under the first heading. Probably the reason why the old-fashioned term "phlegmonous," which has almost dropped out of use elsewhere, is still retained for this condition, is the rarity of the affection. In his article in

Allbutt's *System of Medicine* (Vol. III., p. 423) in 1897, Leith estimates the recorded cases as 85; while in a recent review Moynihan¹ gives an epitome of a complete list of all recorded cases, 81 in number, including six since 1897. There are two distinct forms, the diffuse and the circumscribed. In the diffuse the whole stomach may be affected, or the change may be limited to one part, especially the pylorus—an evidence of some value in showing that infection takes place from an ulcer. There is nothing specially characteristic in the symptoms, which are those of an intensely acute gastritis, running a rapid course with profound constitutional disturbance and always ending fatally. In the circumscribed form there may be one or many abscesses in the submucous coat; the former may reach the size of a man's fist, and rupture may occur into the stomach or into the general cavity of the peritoneum. The symptoms are the same in type, though not so severe as in the diffuse form. As the condition has not been recognised during life, there is little to say about the treatment, except that surgical measures would be advisable.

PLASTIC LINITIS, OR DIFFUSE CARCINOMA OF THE STOMACH.

The striking condition of the stomach variously called cirrhosis, cirrhotic inflammation, "leather-bottle stomach," and hypertrophic submucous sclerosis, was described in a classical manner by Brinton fifty years ago under the title "Plastic Linitis of the Stomach." The word linitis (*λίνων*, a Homeric word = *rete ex lino factum*) was used to signify "inflammation of the filamentous network of the areolar tissue ensheathing vessels."² The term "plastic linitis" as the equivalent of cirrhosis of the stomach has been almost forgotten in England, but it is used by some foreign writers. Thus in a critical paper dealing with the question whether this condition actually exists apart from diffuse carcinoma of the organ, Hoche³ employs "plastic linitis" as a convenient non-committal descriptive term of the purely macroscopic appearances, such as are seen during an operation or at a necropsy. He carefully investigated five

¹ *The Medical Chronicle*, November, 1903.

² Brinton, W.: *Lectures on Diseases of the Stomach*, Ed. II., p. 273, 1854.

³ *Rev. de Med.*, November-December, 1903.

cases of diffuse "cirrhosis" of the stomach-wall, which all had the naked-eye appearance of fibrosis and not of carcinoma, but they were all found to be due to infiltrating carcinoma. It is worth while drawing attention to the fact that in three of these cases the diffuse infiltration had in parts the appearance of sarcoma or fibro-sarcoma; and if the sections had not been sufficiently numerous and sufficiently large ($2\cdot5 \times 2$ cm.) the lesion might have been so regarded. While admitting the possibility that gastric ulcer may lead to submucous fibrosis, mainly near the pylorus, and that possibly simple chronic gastritis, peritonitis, and purulent interstitial gastritis may lead to fibrotic changes in the walls of the stomach and produce the appearance of plastic linitis, Hoche concludes that the vast majority of cases coming under this category, especially those that are diffuse, are the result of carcinomatous infiltration of scar-tissue, usually in association with, or subsequent to, gastric ulcer. In this connection attention may be drawn to the remarkable condition of diffuse carcinomatosis of the stomach and intestines described by Nuttall and Emanuel,¹ who could not find references to any similar cases. In their three cases the stomach was of the typical "leather-bottle" variety, either in part or as a whole. In Case i. the pyloric end of the stomach, the small intestine in places, and the whole of the colon were widely infiltrated with carcinoma, there being a stricture in the ascending colon; in Case ii. the whole of the stomach, the small intestine in places, and the whole of the colon were affected, the pylorus being stenosed; in Case iii. the whole of the stomach, parts of the small intestine, the caecum, colon, and rectum were involved, there being strictures at the pylorus, caecum, hepatic and splenic flexures, and the rectum. The growth formed a thick continuous layer occupying the sub-mucosa, and a less thick but still continuous layer in the subserosa. The growth had undergone a varying degree of colloid degeneration, which somewhat masked its carcinomatous nature, and indeed at first suggested that the growth was an endothelioma.

MALIGNANT DISEASE OF THE STOMACH.

The post-mortem records of Guy's Hospital from 1826 to 1900 contain 306 cases of malignant disease of the stomach

¹ A. W. Nuttall and J. G. Emanuel: *Trans. Path. Soc.*, Vol. LIV., p. 90.

among 21,260 autopsies, or 14 in every 1000. These 306 cases have been carefully recorded and analysed by Sir Cooper Perry and Dr. L. E. Shaw¹ in the current number of *Guy's Hospital Reports*. Though the critical analysis is not completed and will be continued in a later volume, there are many points of interest to which attention may be drawn now. More than half the cases occurred between 40 and 60 years of age, and more than one-third proved fatal between 40 and 50, the youngest female being 18 years, the youngest male 15 years, the oldest male 71, and the oldest female 81 years. Eighteen patients died in their 45th year, 13 males and 5 females ; this was the largest number of cases at any one age for either sex. Of 300 cases in which the sex is available 218 were males and 82 females. The average interval between the onset of symptoms and death is estimated at 8½ months ; in 6 instances the duration of symptoms was unusually long, and since in three of them haematemesis occurred 5, 2½, and 2 years respectively before death, the question naturally arises whether this was not due to a simple ulcer ; in two other cases carcinoma may have existed for 4 years. Consideration of the cases does not lend much support to the view that injury, chronic dyspepsia, alcoholism, and simple ulcer are causal factors in the production of carcinoma, with perhaps the single exception of simple gastric ulcer. In twelve cases there was some reason to suppose that simple ulcer was associated with malignant disease ; ten of these, it is interesting to note, occurred in the last hundred cases or since 1888, after Hilton Fagge, in his *Practice of Medicine*, had drawn attention to the possible development of carcinoma in a simple ulcer. In twenty cases of latent gastric cancer, in which stomach-symptoms were absent, seven died with, but not from, the disease, one being a woman, aged 81, who succumbed to a strangulated femoral hernia ; the other thirteen cases showed either secondary results, such as ascites, enlarged liver, spontaneous fractures, etc., or cachexia and anaemia. Dysphagia was only present in ten cases, and in all but two there was definite mechanical obstruction at the cardiac orifice. Haematemesis, at some time during the course of the illness, occurred in rather more than

¹ *Guy's Hosp. Reports*, Vol. LVIII., p. 121.

one-sixth of the cases ; in six cases hæmatemesis was fatal, and in four other cases there was fatal haemorrhage into the stomach without any hæmatemesis, the stomach being found at the necropsy full of blood. It is remarkable, and hardly in accordance with the usual statements found in text-books, that out of a series of cases of gastric cancer, in which hæmatemesis is recorded as occurring in under 20 per cent. of the cases, nearly 4 per cent. of the whole number should prove fatal from haemorrhage. There were thirty-two cases of acute peritonitis ; in twelve some operation such as laparotomy, gastrostomy, &c., or paracentesis had been performed ; in seven there was no such cause, but softening of secondary growths was regarded as the most probable factor. In the remaining thirteen cases perforation of the stomach was the cause of acute peritonitis ; In seven other cases perforation of the gastric wall only caused a local peritoneal abscess. The difficulty of recognising the existence of perforation of the stomach or of the resulting peritonitis in cases of cancer, is in striking contrast with the prominent symptoms produced in simple ulcer by these events. This is chiefly explained by the serious condition of the cancerous patients, who are often moribund when perforation occurs, and may also depend on the absence from the gastric contents of hydrochloric acid, which has an irritating effect on the peritoneum, and on the presence of ascites, which would dilute the extravasated gastric contents.

DIAGNOSIS OF GASTRIC CARCINOMA.

In a judicial paper, based on the examination of some forty cases, J. R. Arncill¹ discusses the important question—"Do any of the modern gastric methods furnish us with the means of making an early diagnosis of gastric carcinoma"? While freely admitting that the association of a persistent absence of hydrochloric acid, the presence of lactic acid, Oppler-Boas bacilli, yeast and retained food, with a tumour and cachexia, in the vast majority of cases means carcinoma, and that this diagnosis is justified even in the absence of a palpable tumour, he concludes that the positive diagnosis of a case in its early stage is absolutely impossible. Thus all the laboratory tests

¹ *American Medicine*, January 16, 1904, p. 93.

pointing to gastric carcinoma, except of course fragments of growth, may be found in chronic gastritis with dilatation. Further he finds that a persistent absence of free hydrochloric acid from the stomach-contents is more constant in, and characteristic of, pernicious anaemia, than of carcinoma of the stomach, and that in a small percentage of undoubted cases of malignant disease of the stomach there is a fair amount of free hydrochloric acid. Correct diagnosis is, therefore, more likely to be attained by the medical man who takes a broad view of his cases from the point of view of physical examination combined with the assistance of laboratory methods. The younger medical generation is apt to exaggerate, while the older school is likely to minimise, the value of laboratory methods.

Mouisset and Tolot¹ have investigated the bearing of anaemia, leucocytosis, and the differential leucocyte-count on the diagnosis of gastric carcinoma with the following results. A diminution in the number of erythrocytes has a definite relation to the constitutional condition; thus it is absent at an early stage when nutrition is maintained, and appears with the advent of cachexia. In one case with cachexia there was a want of correspondence between the hypoglobinaemia and the degree of wasting, which was explained by the fact that the constitutional symptoms dated from the onset of lienteric diarrhoea. The fall of the corpuscular haemoglobin-value is an important sign of gastric cancer, which does not appear to have attracted much attention, although one of the authors (Mouisset) pointed out in 1891 that it was of use in distinguishing that condition from hepatic cirrhosis, gastric ulcer or catarrh, and of course from pernicious anaemia. This fall in the corpuscular worth may, however, be absent in the early stages of the disease, or when sudden alterations occur in the number of the erythrocytes. Leucocytosis, when not due to inflammatory complications, is generally a late event in the case of the disease, and only occurs when cachexia has come on. The differential leucocyte-count, which has been thought to show a mononuclear increase by Hayem, a polymorphonuclear increase (Strauss and Rosenstein), or a mononuclear in the early stages followed in the late stages by a polymorphonuclear increase,

¹ *Rev. de Méd.*, October 10, 1902, p. 844.

did not appear to the authors to justify any conclusions in the diagnosis of gastric carcinoma.

SOLITARY TUBERCLE OF THE STOMACH.

Van Wart¹ describes an example of this condition—which is similar to that met with in the central nervous system, but has not been previously recorded—in the stomach, an organ whose freedom from tuberculosis is remarkable. The patient was a negress, aged 88 years, who died with chronic bronchitis, emphysema, and *morbus cordis*. Six centimetres from the cardiac end of the stomach, along the greater curvature, there was a thickening of the gastric wall, and growing from this spot was a tumour, nearly spherical and with a diameter of 3·5 cm. This was covered by intact mucous membrane, and occupied the greater part of the lumen of the organ : it could be readily palpated through the walls of the stomach, and if it had been present anywhere else than under the costal margin, could probably have been detected by careful examination during life. The tumour was surrounded by a fibrous capsule, and was embedded between the layers of the muscular coat. It contained caseous material, which showed tubercle-bacilli and produced tuberculosis in guinea-pigs. There was no other manifest tuberculous focus in the body ; so this was probably primary tuberculosis of the muscular coat, and thus differed from the cases of tubercular ulcers of the gastric mucous membrane described by Hamilton, Blumer, and Przewoski, which were secondary to extensive tuberculosis elsewhere. The similarity of this case to those of the rare so-called simple abscess of the stomach, recorded as having been discovered on post-mortem examination, is striking ; and Van Wart suggests that more careful microscopic and bacteriological investigations in the future may show that some of the latter are tuberculous.

INDICANURIA IN AFFECTIONS OF THE STOMACH.

Although chemical examination of the gastric juice is usually considered the only means of gaining a knowledge of the nature of the gastric secretion, and is undoubtedly the most satisfactory, it is not always practicable ; thus a patient may resent or

¹ *Bull. Johns Hopkins Hosp.*, Vol. XIV., p. 235.

decline to undergo the manipulations involved in a test-meal. In such cases Carles¹ has found that the presence or absence of Indican in the urine may have a definite diagnostic bearing on the condition of the gastric juice. Indican is derived from Indol, and is chiefly found in the urine in cases where there is obstruction to the passage of food out of the small intestines, and in peritonitis. Indol being mainly due to the bacterial putrefaction of proteids in the small intestine, factors which inhibit or favour this process will influence the incidence of indicanuria. The bactericidal power of the gastric juice depends on the presence of hydrochloric acid, and Carles' observations show (i.) that Indican does not appear in the urine in hyper-chlorydria ; (ii.) that Indican is almost always present in the urine when the amount of hydrochloric acid in the gastric juice is diminished and in cases of gastric fermentation ; (iii.) that Indicanuria is well marked when hydrochloric acid is absent from the gastric juice, as in cases of gastric carcinoma and fever.

THE UNRELIABILITY OF ALTERATIONS IN THE HEPATIC DULNESS AS A SIGN OF PERFORATION OF THE STOMACH.

The diagnosis between perforation of the stomach or intestines with escape of gas into the peritoneal cavity on the one hand, and excessive tympanites, may be extremely difficult. Disappearance of the hepatic dulness on the anterior surface of the abdomen may occur in both conditions. A distinction, however, has been drawn between alteration of the liver-dulness in the mammary and anterior axillary lines, where it is usually estimated, and modifications in the mid-axillary lines. Thus Thornton² finds that while the hepatic dulness may be absent in the mammillary and anterior axillary lines it never disappears from the mid- and posterior axillary lines in tympanites ; he therefore regards absence of the liver-dulness in the latter position as almost conclusive proof of the presence of free gas in the peritoneal cavity.

English³ specially tested this point in ten cases of perforated gastric or duodenal ulcer, and found that in four the absence of

¹ Carles, J. : *Rev. de Méd.*, 1903, p. 297.

² *Lancet*, 1902, Vol. I., p. 442.

³ *Medico-Chirurg. Trans.*, Vol. LXXXVII.

liver-dulness extended as far back as the mid-axillary line ; on the other hand, he found a similar condition in two cases in which the abdomen was opened, but no perforation found. It therefore appears that no reliance can be placed on this sign. Considerable variations in the extent of the liver-dulness may occur without any good explanation. Pearson¹ found that there was considerable diminution in the liver-dulness during some part of their stay in hospital in at least 33 per cent. of 140 cases of gastric ulcer, in none of which perforation occurred.

¹ S. V. Pearson : *Medical Chronicle*, March, 1904, p. 363.



**SEBORRHœA AND THE SEBORRHOÏDES:
A REVIEW OF SOME RECENT LITERATURE ON SKIN-DISEASES.**

By J. M. H. MacLEOD, M.D., M.R.C.P.,

*Assistant Physician for Diseases of the Skin, Charing Cross Hospital;
Physician to the Skin Department, Victoria Hospital for Children.*

IT is to the eminent French dermatologist, Rayer, that we are indebted for the first clear recognition of a fatty state of the skin resulting from a hypersecretion of the sebaceous glands, or, as he called it, a "flux sébacé." Since his time seborrhœa (or an excessive output of sebum by the sebaceous glands) has been regarded as playing a more and more important part as the underlying cause of a series of affections of the skin. Unna's conception of seborrhoic eczema did much to increase its importance, and now with the introduction by the French school of the class-name of "séborrhéides," to include a series of morbid states of the skin more or less dependent on seborrhœa, it has been brought into even greater prominence. In choosing this as a subject for review I have been largely influenced by two considerations: first, it is a subject which stands out prominently on account of the amount of detailed and patient research which has been carried out in connection with it during the last few years; and second, it is a subject which has evolved recently to such a degree that it is difficult even for those whose work it is to deal specially with diseases of the skin, and far more so for the busy practitioner, to know exactly how they stand with regard to it. Besides, the various types of cutaneous affections which come under the heading of seborrhœa and the seborrhouïdes are amongst those which most frequently present themselves for diagnosis and treatment. At the present time the subject is in a state of complexity; and this is partly due to the fact that different writers have employed the names connected with it in different senses, or in their descriptions of it have attacked it from different points of view, and partly because it has been widened out to include such a variety of types of skin-diseases that it bids fair to rival

eczema as a dumping-ground for various affections of the skin whose real nature is still imperfectly understood. Nor has the final word been said upon it, for, in spite of the researches of Unna and Sabouraud and the writings of Besnier and Brocq on the Continent, and of Colcott Fox and others in this country, there are still many debatable points in connection with its aetiology, symptomatology, and pathology; and it is well to remember that there are those who consider that the importance of seborrhœa as a causal factor in disease of the skin has been greatly exaggerated.

One of the most comprehensive descriptions of the subject, and the most recent, is the article on it by Audry,¹ in the fourth volume of *La Pratique Dermatologique*, published in the beginning of this year. In it he defines seborrhœa as "an anomaly of the skin, characterised by a greasy appearance which can be detected clinically." But whether this anomaly is simply a functional derangement due to a variety of causes, or is a morbid entity the result of a definite pathogenetic agent, is a question which is still *sub judice*.

There are certain regions of the body in which the skin is naturally more oily than in others—where in fact there exists what has been called a "physiological greasiness." These situations are the side of the nose, the concha of the ear, the forehead, the scalp, and the sternal, inter-scapular and inguinal regions; and these may be termed the classical sites of seborrhœa.

Sebum is a fatty secretion of the sebaceous glands, and its function is to lubricate the hairs and the surface of the skin in the neighbourhood of the hair-follicle. About puberty, when these follicles undergo a natural development, there is a distinct increase in sebaceous secretion in the classical sites, and the skin in these regions may be seen, not only to be greasy, but—by the aid of a hand-lens and sometimes with the naked eye—to be dotted over with tiny oily beads or fatty plugs blocking the mouth of each hair-follicle. In most instances this natural oily seborrhœa of puberty gradually disappears, but in certain individuals the greasiness of the skin may persist, and a condition of permanent seborrhœa be established.

In 1881, at the International Medical Congress held in

¹ "Séborrhœe—Séborrhœides," *La Pratique Dermatologique*, Vol. IV., 1904, p. 270.

London, Unna asserted that the greasiness of the skin was not derived from the sebaceous glands, but was produced by the sweat-glands ; that the function of sebum was limited to the lubrication of the hairs ; and that the oily state of the skin was not the result of a seborrhœa, but was due to a hyper-excretion of sweat, or in his own words was a "hyperidrosis oleosa." This theory put forward by Unna was not a new one, for Henle¹ had previously taught that the "sweat-glands as a whole secrete fat." That the sweat contains a variable proportion of fat has been definitely proved—for where else does the oiliness on the surface of the palms and soles come from if not from the sweat-glands, as there are no hair-follicles with sebaceous appendages in these regions ?—but that the fat on the surface of the skin is derived entirely from these glands is quite another matter. It does not seem reasonable to suppose this to be the case, when we remember that, where the hairs are largest, the sebaceous glands attached to the follicles are smallest, and that where the lanugo-hairs are very small, as at the side of the nose, the sebaceous glands are unusually large. Further, in certain situations, such as the areolæ of the nipples, sebaceous glands occur independently of hair follicles, and as they open directly on the surface of the skin instead of into a hair-follicle, it is evident that they have some function other than the lubrication of the hair. That function is the lubrication of the surface of the skin immediately around the opening of the duct or follicle. The sebaceous secretion differs from the sweat, not only in its chemical composition, but in the method by which it is eliminated ; the sweat being excreted through the agency of a special nerve-mechanism, while the secretion of sebum appears to be independent of nervous impulses and to take place from the *vis a tergo* of cells constantly forming behind and gradually undergoing a fatty degeneration. The time-honoured theory that the sebum is expelled by the contractions of the arrector-pili muscle of the follicle is no longer credited.

I mention these histological and physiological facts by the way, because they seem to suggest that seborrhœa is much more readily explicable as due to an enlargement of the sebaceous glands either from natural or pathological causes, than

as the result of a transient functional derangement. The older writers, such as Rayer and Fuchs, taught that the excessive oily secretion of the sebaceous glands under certain circumstances, not necessarily pathological, became altered in quality, and by losing part of its fluid constituents became waxy and capable of "setting" to form, with the desquamating epidermis, dry scales or scurf, and in this way the conception of dry seborrhœa (*seborrhœa sicca*) originated. Various degrees of this dry seborrhœa were described, from slight dandruff of the scalp and glabrous skin (*pityriasis alba*) to conditions in which the scalp was caked over with greasy crusts. Two types of seborrhœa thus came to be distinguished—*S. oleosa* and *S. sicca*. The dry form, like the oily variety, was believed by these writers to be a functional disturbance, chiefly because there were no gross evidences of inflammation associated with the presence of the greasy scales ; but as Colcott Fox¹ pointed out in his *résumé* of the subject at the meeting of the British Medical Association at Cheltenham in 1901, redness is not an essential accompaniment of slight degrees of inflammation, as is evident in the scalp in the case of the scaly patches of small-spored ringworm, which as a rule show no definite signs of it.

This view, that seborrhœa *oleosa* and *S. sicca* were different degrees or variants of the same morbid process, was gradually found to be incorrect, and the fact that they were essentially different conditions became recognised with the discovery that the scales in *pityriasis* did not originate in the sebaceous glands at all, but were produced by the exfoliation of the superficial horny epidermis. As Sabouraud tersely puts it, "Seborrhœa is never scaly ; it is always and exclusively fatty." Instead of employing the term *seborrhœa*, several writers prefer to call it "*steatorrhœa*," and the oily condition of the skin around the mouth of the follicles "*steatidrosis*."

Oily seborrhœa not only occurs at puberty and in the adult, but it is also found in infants ; and it is very common in old age, either in a form similar to that of puberty, or as greasy seborrhoic warts. It is specially noticeable in hot weather and in individuals who do not wash sufficiently. The fatty plugs or cocoons already referred to, which occur at the dilated

¹ *Brit. Med. Journ.*, Sept. 28, 1901.

openings of many of the hair-follicles, are brownish or grey at their outer extremities, and are mild degrees of the ordinary comedo. This fact was long ago pointed out by Biett, and recently it has been corroborated by Barthélemy and by Sabouraud, who defines the comedo as a "cystic transformation of a primitive seborrhœic plug." Sabouraud also considers that oily seborrhœa of the scalp is the cause of alopecia areata.

The principal work which has recently been done in connection with seborrhœa has been in reference to its microscopical anatomy and bacteriology, and with this the names of Unna and Sabouraud¹ are most intimately associated. The main point at issue is whether the condition is simply a functional derangement or is the result of an organic change in the glands caused by a specific microbe. In deciding this problem there is the initial difficulty that the fatty secretion of the sebaceous glands is a most favourable soil for the growth of micro-organisms, and though a special microorganism may be isolated constantly from the oily drops or the plugs, it does not follow that it is more than a harmless denizen of the skin which has proliferated actively on account of its suitable surroundings. Sabouraud insists that the seborrhœa is due to the invasion of a small bacillus, which he has named the "seborrhœic micro-bacillus," and that this microbe exists entire as separate elements or as composite mycelial clumps, and forms pure cultures in each seborrhœic follicle. The cultivations of this bacillus grow in acid media, and are reddish in colour and conical in form; and the technique for obtaining them is complicated and difficult. Various experimenters have severely criticised this assertion of Sabouraud, and it is gradually losing ground. Norman Walker made many efforts to isolate the bacillus, but only once succeeded in doing so. Audry, though admitting that it may be present, does not believe it to be the cause of the affection. Not only does seborrhœa appear to be independent of microbic infection, but it seems to be more than a functional derangement, and may be regarded rather as a developmental anomaly, which is apt to become manifest chiefly at puberty, or may result from a congenital peculiarity or tendency to growth on the part of the glands.

¹ *Maladies du Cuir chevelu*, I., "Les Maladies Séborrhœiques." Paris, 1902. Masson et Cie.

Seborrhœa oleosa in itself is an affection of no serious importance, unless it reaches an unusual degree of intensity, when, especially in young girls, it may call for treatment. It is the sequelæ of seborrhœa which are of consequence—those skin-affections which result from the action of some morbid process on a seborrhoic basis, such as acne vulgaris, eczema seborrhoicum of Unna, senile seborrhoic warts, which are apt to become malignant growths, and various pustular forms of dermatitis which depend for their existence on the facility with which microorganisms can flourish in the sebaceous secretions. It is this class of cutaneous affections which the French school of dermatologists have grouped under the heading of the "Séborrhéides"—a term which, in its anglicised form of "seborrhoids," is becoming more and more familiar in writings on skin-diseases. The term is a useful one, and is analogous to such names as syphilide and tuberculide. The seborrhoides are dermatoses which differ more or less from seborrhœa, but which are preceded by it or associated with it. Under this heading Audry includes acne vulgaris, pityriasis, and the eczematous seborrhoides. Classification is one of the chief difficulties of dermatology, and such an arrangement as this has marked defects, the chief of which is the inclusion of pityriasis or the seborrhœa sicca of Hebra in the group. Sabouraud considers that alopecia areata should also come under this heading, believing it to be caused by seborrhœa, but this view is opposed by the majority of writers; and as Colcott Fox and Dubreuilh have pointed out, oily seborrhœa may last a very long time without causing alopecia. Indeed the latter is more liable to be associated with an abnormal hair-development than with defective growth.

The close relationship of acne vulgaris and seborrhœa has been conclusively demonstrated. It was recognised years ago by Biett, and has received confirmation and scientific proofs by the researches of Schutz, Sabouraud, and others. Sabouraud maintains that the seborrhoic state is absolutely necessary for the development of acne, and Colcott Fox, in a review of his work, agrees that there can be no acne without a preliminary oily seborrhœa. Before an acne-pustule can evolve, it is essential for the follicle to be plugged by a comedo, and according to Sabouraud a comedo is a cystic transformation of

a seborrhoic plug, caused by the seborrhoic micro-bacilli. The comedo subsequently becomes infected with the common skin-cocci, which grow as grey cultures, and these cause the inflammation and pustulation; or if it become infected by more virulent microbes, such as the staphylococcus pyogenes aureus, a more severe, scar-leaving acne results or even furunculosis. Unna also recognised the presence of small bacilli on the comedo, similar to those described by Sabouraud, and Gilchrist named it the "Bacillus acne." That they constantly occur is generally admitted. A large number of workers have established that fact, and an excellent demonstration of them on a comedo was given at a recent meeting of the Dermatological Society of London by Adamson. That they cause the seborrhoic plug and the comedo to form, is not proved, any more than that the flask-shaped bacilli and diplococci which usually occur in the comedo cause it.

The second type of seborrhoide referred to by Audry is pityriasis, by which is meant a white scurfy or desquamative condition of the skin, appearing in circumscribed areas and independent of any apparent inflammatory phenomena. This is a retrograde arrangement, for even Audry himself admits that the scales result from an abnormal desquamation of the horny layer and have nothing to do with a sebaceous hypersecretion. This horny exfoliation is now believed to be a mildly-inflammatory affection, and Sabouraud believes it to be caused by specific microorganisms, namely, a coccus giving grey cultures and flask-shaped bacilli. According to other observers these organisms are not specific, and the grey coccus referred to is one of the most ubiquitous microbes of the skin and may be isolated from the healthy stratum corneum. This pure pityriasis, though having nothing to do with oily seborrhœa, may be superimposed upon it, in which case the familiar greasy and scaly affection of the scalp usually designated as seborrhœa capitis results; or if it occurs on the body, the eruption of brownish-red scaly lesions, frequently exhibiting a circinate arrangement, and present chiefly in the sternal and interscapular regions, is produced—an eruption which the older English writers on skin-diseases christened "flannel-rash," and which is now more generally known as "seborrhœa corporis."

This compound affection overlaps, and leads us on to, Audry's

third type of seborrhoïde, which he has named the "séborrhéide eczématisante," and which corresponds in the main with Unna's seborrhoic eczema. He defines this variety as "a circumscribed affection of the epidermis; well-defined and recognisable in four-fifths of the cases; probably parasitic and specific in origin; perhaps contagious and inoculable; and of which the causal agent still remains undetermined." The initial lesion is a hyperæmic spot or patch, pink or yellowish-red in colour, not raised, and covered by a slightly scaly epidermis. Occasionally the patches may become slightly raised and papular, and may increase to form a fawn-coloured scaly plaque or circinate patch. It is the flannel-rash over again. Acute forms of it may also occur, in which the lesions are erythematous-vesicular, and these bring it into relation with eczema in the original meaning of that much-abused term. Sometimes it is more psoriasisiform in type, but it is distinguished from psoriasis by the scales being more greasy and less silvery, by the lesions being yellowish in tinge instead of bright pink, and by its not having the same tendency to attack the exterior aspect of the limbs, and the elbows and knees, which are the classical sites of psoriasis. Unna pointed out that in a large percentage of cases this affection began in the scalp with the presence of slight inflammation and the appearance of a greasy scurf, and that it spread from there on to the trunk. The most natural explanation of this common affection is that it is parasitic; but a specific microbe has not yet been established. Many writers, while granting the truth of the clinical conception of "seborrhoic eczema" as put forward by Unna, consider the term "eczema" as misleading and unfortunate, and prefer to employ the non-committal name of "seborrhoic dermatitis."

Radcliffe-Crocker, on account of the clinical differences which the lesions presented, employed the following classification for the seborrhoïdes :—

(a) Seborrhœa eczema-formis. In this condition the scalp is at first scurfy; then as a result of some depressing influence, or other cause, an active inflammation occurs, and "the scalp becomes hot and red with abundant flaky and fatty scales," and this spreads on to the glabrous skin. The lesions so produced may be scratched and oozing may take place, with formation of greasy crusts. He also includes under this heading

the dry, defined, scaly patches which are frequently present on the limbs and trunk.

(b) *Seborrhœa psoriasisiformis*. Here the lesions are like those of psoriasis, but differ in that the scales are more fatty and not so abundant.

(c) *Seborrhœa papulosa seu lichenoides*, which forms "a serpiginous, papular, ringed eruption, limited to the trunk."

The transference of so many varieties of dermatitis, which are probably of parasitic origin, but in which a specific microbe has not yet been established, even though they are to a greater or less extent associated with seborrhœa, out of the old class of scaly eczema into a new order—that of the seborrhoïdes—savouring rather of "out of Scylla into Charybdis." Still it is a practical grouping so far as treatment is concerned, for, with the exception of acne, seborrhœa and the seborrhoïdes require much the same line of treatment, modified to suit the special peculiarities of individual cases. Except in special circumstances, internal treatment is not indicated, active local treatment being all that is required. If internal remedies are called for, these are more in the nature of tonics, aperients and the like, than of specifics, and should be prescribed according to general principles.

The most generally effective local treatment is by means of ointments, with a base of equal parts of lanoline and vaseline, containing 2 to 6 per cent. of precipitated sulphur. If there be much scaliness, 1 to 2 per cent. of salicylic acid may be added to the ointment; or if the lesions have become secondarily infected with the ordinary pus-cocci, the same percentage of ammoniate of mercury may be substituted.

In widely disseminated cases sulphur-baths are of some value, either the natural sulphur-baths of various health-resorts, such as Barèges, Cauterets, and Luchon, or medicated sulphur-baths at home.

Uncomplicated seborrhœa oleosa rarely calls for treatment, but it may do so in young women if the nose be severely affected. In such cases the grease should be thoroughly washed off by soap-spirit lotion, and the part then be dusted over with a dusting-powder containing precipitated sulphur; or a lotion containing the same powder may be dabbed on. The sebaceous plugs associated with the affection should also be

squeezed out from time to time. It would be out of place here to go into the treatment of acne ; but it may be mentioned that recently the Röntgen-rays have proved of extreme value in cases in which the lesions were unusually chronic and indurated. But I question if the results obtained from the rays are much better than those which may be obtained by patiently incising each pustule and nodule as it appears, thoroughly expressing the comedones, and keeping the surface of the skin as completely aseptic as possible with boric fomentations, antiseptic lotions, and dusting powders.



Public Health.

A NOTE ON THE RECRUDESCENCE OF SMALL-POX IN LONDON IN 1904.

By **GEORGE NEWMAN, M.D., F.R.S.E.,**

Medical Officer of Health of the Metropolitan Borough of Finsbury.

THERE has been, as is well known, a slight recrudescence of small-pox in London during the spring of the present year, and it is of interest to consider some of the points concerning it ; for it happens that such a recrudescence frequently brings out clearly certain points in the mode of the spread of the disease which are not always so evident in large epidemics.

In the first place there is the seasonal rise in prevalence which is usual about the month of March. An examination of the official returns of notification will show that in January of the present year there were in all London 17 cases of small-pox notified ; in February, 19 ; in March, 108 ; and in April (up to week ending April 9), 62. The total number of cases notified, therefore, to the time of writing has been 206, of which 52 per cent. occurred in March. Cold weather appears to favour the recrudescence of small-pox, though in what way it acts is not known. Possibly it is a mechanical operation, the cold weather tending to encourage overcrowding, and so on. It will be remembered that in 1902 the large epidemic reached its climax in March, with a total for the month of nearly 2,000 admissions to the hospitals of the Metropolitan Asylums Board, or a daily average of upwards of 62 patients. And there are other illustrations of the broad fact of the seasonal rise of small-pox in the early spring. The appreciable rise in small-pox in London this year took place in the week ending March 12, when 24 notifications were made. The following weeks there were 23, 54, 37, and 25 ; and though it is of course impossible to say what may happen, it is not unlikely that this represents the zenith of the spring wave.¹

In the second place, there is the geographical and social

¹ In the week ending April 16, 33 further cases were notified.

distribution. In 1902 the maximum rise in March was due chiefly to the occurrence of cases in the East End of London, and in the present year a somewhat similar phenomenon presents itself. For taking the notifications made since January (to April 9)—a certain number of which of course turned out not to be small-pox—we find that of the total 206, 57 occurred in Bethnal Green, 50 in Stepney, and 31 in Poplar, which gives a percentage of 66 on the total derived from the East End. Southwark is credited with 14, of which 3 proved not to be small-pox, and the remaining 55 cases were spread over fifteen districts of the metropolis. This geographical distribution is of course a social distribution. As in previous outbreaks, the forerunners have been mostly patients of the poorest class—tramps, vagrants, and dwellers in common lodging-houses, or those without abiding place of any sort. It is often impossible in this class to trace infection or to supervise contacts, and it is well known that such persons are ill-protected by vaccination. They form in the metropolis and in the provinces a floating population, often unvaccinated, almost always careless of sanitary precaution, passing hither and thither carrying infection with them. In the recent report of the Local Government Board the statements of the poor-law inspectors as to the harm done by such vagrants were very emphatic. There can be little doubt that the origin of the recent recrudescence in London as in the provinces during the last eighteen months is traceable to this class of the community. At the end of last year several scattered cases of small-pox occurred in South London in workhouses and similar institutions, and from these secondary cases arose in other parts of London in common lodging-houses and similar places, cases still continuing to occur in workhouses in South London. The chief incidence of the disease occurred in Bethnal Green and Stepney. In the former district some unrecognised cases set up infection in one particular street, from which a number of cases arose both in Bethnal Green and elsewhere. The same thing occurred in Stepney in a common lodging-house. Then there were also the London Hospital cases in Stepney. These three groups of cases all arose from failure to diagnose small-pox from chicken-pox and other similar rashes, and they all arose, broadly speaking, in the same class of the community.

METROPOLITAN ASYLUMS BOARD.

RETURN of CASES of SMALL-POX notified during 1904, up to April 9, under the provisions of the Public Health (London) Act, 1891.

Borough in which the Cases were Resident.	Jan. 2.	Jan. 9.	Jan. 16.	Jan. 23.	Jan. 30.	Feb. 6.	Feb. 13.	Feb. 20.	Feb. 27.	Mar. 5.	Mar. 12.	Mar. 19.	Mar. 26.	April 2.	April 9.	Total
<i>West.</i>																
Paddington -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Kensington -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hammersmith	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fulham -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chelsea -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Westminster -	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
<i>North.</i>																
Marylebone -	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Hampstead -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Pancras -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Islington -	-	-	-	1	-	1	-	1	-	-	1	-	2	2	2	8
Stoke Newington.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hackney -	-	-	-	1	-	-	2	-	-	-	1	1	2	-	-	7
<i>Central.</i>																
Holborn -	-	-	1	-	-	-	-	-	-	1	-	1	-	-	-	3
Finsbury -	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2	2
City of London -	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
<i>East.</i>																
Shoreditch -	-	-	-	-	-	-	-	1	-	-	-	-	-	1	2	2
Bethnal Green -	-	-	-	2	-	2	-	-	4	6	7	14	14	8	57	57
Stepney -	-	-	-	1	-	-	-	1	-	7	7	16	13	5	50	50
Poplar -	-	-	-	1	-	-	1	-	8	2	11	2	5	5	31	31
<i>South.</i>																
Southwark -	-	4	-	-	-	1	-	1	-	2	-	5	1	-	14	14
Bermondsey -	-	-	-	-	-	3	-	-	-	-	-	1	-	-	4	4
Lambeth -	-	1	-	1	1	-	-	-	-	2	2	1	-	1	9	9
Battersea -	-	-	-	-	-	1	-	4	2	-	2	-	-	-	7	7
Wandsworth -	-	-	-	-	-	-	-	-	-	2	-	-	-	1	2	2
Camberwell -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Deptford -	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
Greenwich -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lewisham -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Woolwich -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Extra - Metropolitan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals -	-	6	3	5	3	7	1	8	3	7	24	23	54	37	25	206

Ten years ago, at the time of the previous large epidemic, Dr. H. E. Armstrong set on foot an enquiry which revealed the fact that the disease had been first introduced by vagrants in 58 per cent. of the 63 large towns from which returns were received, and had been carried sooner or later by the same class of persons into 72 per cent. of these towns. Early in the present year Dr. Armstrong has made a somewhat similar enquiry, with the result that of the 111 towns affected and making returns, 57, or 51 per cent., were first infected with small-pox through the channel of vagrants. In some of the larger towns small-pox was introduced secondarily as many as twenty-five and thirty times. It is now well known that vagrancy is on the increase, and it becomes evident that unless some vigorous measures are taken the community will suffer more in the future than it has in the past from the unrestricted spread of disease by this channel.

The chief difficulty in finding a practical solution to this problem is the question of early diagnosis. The London epidemic of 1902 obtained a foothold because the first cases were unrecognised, and precisely the same event has been

Disease.	Total Cases.	Percentage.
Chicken-pox	203	33·4
Dermatitis unclassified	74	12·2
Measles	48	7·9
Acne	42	6·9
Eczema	31	5·1
Syphilis	34	4·9
Lichen	26	4·3
Erythema rheumaticum	13	2·1
Nettle-rash	12	2·0
Scabies	11	1·8
German measles	7	1·1
Vermiculites	7	1·1
Vaccination rashes	3	0·5
No ascertainable disease	36	5·9
Various (stated in report)	64	10·5
Total	607	—

the apparent cause of the recent recrudescence. A study of Mr. W. McC. Wanklyn's report, as Medical Officer of the River Ambulance Service for 1902,¹ is full of interest in this connection. There were 7,896 admissions during the year at the wharves. Of these, 7,842 were certified as small-pox and 54 were uncertified. Of the 7,842 cases certified, 7,235 proved to be small-pox and 607 to be not small-pox, a percentage of 7·7 as compared with 13·3 in 1901 and 10 per cent. in the previous epidemic in 1893. The foregoing table shows the chief diseases incorrectly diagnosed as variola.

These figures speak for themselves. It should, however, be added that some of the incorrect diagnoses were due to the prevailing tendency of sending cases to the wharf at an earlier stage than in previous years. For example, of 1,121 cases admitted in January, 1902, 50 per cent. arrived on the first or second day of the rash, and a few were admitted before the rash had appeared. In some instances this practice was carried too far, and of course was then detrimental to all concerned; for example, 36 cases were sent to the wharf in which no sign of any disease could be ascertained.

The general conditions which appear to result in the spread of small-pox naturally act as some indication of the means of prevention. In accordance with the provisions of section 56 of the Public Health (London) Act, 1891, an order has been made by the London County Council requiring for a period of four months the notification of chicken-pox in the Administrative County of London. The order has been duly advertised, and came into operation on April 8, 1904. With a view to facilitating the diagnosis of doubtful cases of small-pox occurring in London, the London County Council also made an arrangement under which any medical man can, without fee, obtain the services of Mr. S. Bingham, formerly Medical Superintendent of one of the Small-pox Hospitals of the Metropolitan Asylums Board, or Mr. W. McC. Wanklyn, late Small-pox Referee to the Metropolitan Asylums Board and Medical Superintendent of the River Ambulance Service. This method of securing expert consultation would appear to be preferable to the method previously adopted by the County Council of appointing

¹ *Metropolitan Asylums Board, Annual Report, 1902*, pp. 232-236.

"local experts." Of course the circumstances are different, and what is now feasible was not practicable in 1902 at the height of the epidemic. Viewing the matter hastily, the temporary notification of chicken-pox is probably justifiable, and for two reasons. First, a certain number of small-pox cases are thus detected which would otherwise escape detection. Secondly, enquiry into cutaneous rashes is stimulated. In regard to the former, the number of such cases detected varies of necessity according to locality and degree of expertness of practitioners. But in 1902, in Bethnal Green, 16 cases were thus detected, in Hackney 22, and in other metropolitan boroughs a certain number were met with in the same way. Altogether in 1902 in more than 100 instances (out of some 4,000 cases) infection was traceable to previous cases erroneously regarded as chicken-pox. A concrete example will illustrate the utility of such notification. In the Borough of Finsbury (pop. 1902, 101,463) we received 690 notifications of varicella in the year. Enquiries were instituted in respect to each of these cases, and a number of them were visited by me. As to the cases throwing light on small-pox, three cases were notified as chicken-pox which, on examination, I found to be small-pox. They would not have been detected quite so soon if there had not been notification of chicken-pox. One of them apparently set up no further infection. The second, on the other hand, was the origin of a group of ten cases (sixth group), some of which, at least, would have been undetected if we had not received this "chicken-pox" notification. The third "chicken-pox" case gave rise to only one other. The facts respecting these three cases of notified chicken-pox, which were in fact small-pox, do not by any means exhaust our experience of the relation between the two diseases. Our first group of small-pox cases, numbering in all more than 30 cases, arose from a single case of small-pox mistaken for chicken-pox, namely, a child who went down to the hop-gardens. The second group, consisting of more than 15 cases, also arose from a case of a child with small-pox which had been mistaken for chicken-pox. Once more, a fifth group of eight cases also arose from a precisely similar case. There were, therefore, upwards of 50 cases traceable to mistaken diagnosis between chicken-pox and small-pox. In addition to this there were several cases to which I was called which,

although not yet notified, were supposed to be chicken-pox, and which I found to be small-pox.

Our experience in Finsbury would, therefore, point to the value of the notification of chicken-pox in times of small-pox prevalence. Its value seems to be, in the main, twofold : (*a*) By it, cases of small-pox may be detected which would otherwise be missed. (*b*) By it, a more careful and thorough watchfulness for suspicious cutaneous rashes of all kinds is created. This stimulation of the critical examination of all skin-conditions at times when small-pox is prevalent is a most valuable thing.

The age-incidence of the cases of chicken-pox is instructive when compared with that of small-pox. Of the 690 cases of chicken-pox mentioned above, only 108, or 15 per cent., occurred in children over seven years of age. In the pre-vaccination days, both diseases were diseases of childhood. Now small-pox has become mostly a disease of adults unprotected by vaccination or re-vaccination, and chicken-pox remains a disease of childhood.

In regard to the notification of varicella it should further be observed that it is meant by those who advocate it to serve as the first step in a means of protection. That the system should be of any avail, it is necessary that each case notified should be investigated by the Sanitary Authority, and preferably by the medical officer of health or a special medical officer qualified to make such investigation. This is really one of the practical difficulties. In 1902, during the time that the temporary notification lasted in London, 25,000 cases of chicken-pox were notified, giving a case-rate of 5·9 per 1,000 persons living per annum, which is of course considerably greater than the mean case-rate of other notifiable diseases. (The waves of incidence of chicken-pox in 1902 reached their maximum in June, July, and December in contradistinction to small-pox, which was, as already stated, at its zenith in March.) Now the careful investigation of 25,000 cases of disease is an immense task, especially when added to the routine work of the medical officer of health, and yet unless this is done the *raison d'être* of notification of chicken-pox, as a preventive method against small-pox, is not operative.

Early removal, disinfection, the supervision and re-vaccination of direct contacts, and investigation of each case of

small-pox, is now being carried out in the metropolis by each sanitary authority concerned. The London County Council, in addition to arranging for expert advice, have also re-instituted the daily certification to each medical officer of health of every case of small-pox and its contacts, and undoubtedly this excellent arrangement facilitates the preventive work which in conjunction with vaccination serves as London's protection against the disease becoming epidemic.

But excellent though such methods may be, their utility is greatly lessened owing to our failure to grapple with the two main issues arising out of this brief survey, viz. :—(a) the difficulties of early and correct diagnosis, and (b) the problem of the vagrant. The scientific solution of the former, as regards the practitioner, is of course more exact knowledge as to the symptoms of small-pox, and to acquire this needs very much improved means of clinical training in small-pox, which at present for the ordinary medical student is not what it should be. There is of course a side of the question which must always remain in the hands of the community, namely, the consulting of a medical man in slight cases of small-pox and in the early stage of well-marked cases. This will always be an uncontrollable and an uncertain factor. More urgent still is the second problem, that of the control of the vagrant, and it is to be hoped that the appeals now being made through various county councils and poor-law boards to the central government will not be in vain.

SOME TEXT-BOOKS OF PATHOLOGY AND THEIR TEACHING.

THE advances which have recently been made in the field of pathology are shown among other things by the increase which has taken place in the size of the text-books of this subject. A little while ago a volume of moderate dimensions was sufficient to contain what was definitely known in both morbid anatomy and pathology proper. Now we find a tendency prevailing to divide these into separate volumes. Examples of this, which lie before us at the present time, are seen in the recently-issued book by Dr. Sidney Martin,¹ entitled *A Manual of General Pathology*, and in the second edition of Dr. Lazarus-Barlow's² *General or Experimental Pathology*. Neither Dr. Martin's nor Dr. Lazarus-Barlow's book deals with morbid anatomy, except incidentally. The latter writer has devoted to this and elementary pathology a separate volume which was reviewed in our February number.

That it is to modern experimental work that the advance in pathology is due, is pointed out in the title of Dr. Lazarus-Barlow's book, and is recognised in Dr. Martin's pages. In spite of the assertions of the anti-vivisectionists, this fact is undeniable. And it is evident that since pathology as distinguished from morbid anatomy is concerned with processes rather than with conditions, it is only by experiment on living animals that its problems can be elucidated. The fascinating studies which have been carried out in the field of bacterial infection and immunity would have been impossible without such a means of research. The practical value of these discoveries in the treatment of disease is exemplified in the success which has attended the administration of anti-diphtherial

¹ *A Manual of General Pathology for Students*. By SIDNEY MARTIN, M.D., F.R.S., F.R.C.P., Professor of Pathology at University College; Physician to University College Hospital. London: John Murray. 1904. Price 15s. nett.

² *A Manual of General or Experimental Pathology for Students and Practitioners*. By WALTER SYDNEY LAZARUS-BARLOW, B.A., B.C., M.D., F.R.C.P., Director of the Cancer Research Laboratories at the Middlesex Hospital, late Pathologist and Lecturer in Pathology at the Westminster Hospital. Second edition. London: J. and A. Churchill. Price 21s. nett.

serum, and there are good hopes that other infectious diseases may in time be combated by appropriate serums.

With regard to the arrangement of the books before us, we find that Dr. Martin begins with a consideration of inflammation, passes on to a discussion of infection and immunity, and then considers in turn the pathology of the various systems of organs. Dr. Lazarus-Barlow, on the other hand, places first a short chapter on microorganisms ; then deals with the diseases of the circulation ; next considers inflammation and infection, which are followed by chapters on fever and the disorders of the different remaining systems. It is difficult to appreciate the advantages of this arrangement, as there seems no valid reason for separating the microorganisms from the closely-allied subject of infection and immunity, while the inconveniences of studying the diseases of the circulation, including such states as endocarditis which is of an inflammatory nature, before considering the nature of inflammation, are very evident.

For an instructive example of "a good man struggling with adversity" we have only to watch the misfortunes of a modern pathologist who tries to give an intelligible and consistent account of inflammation as a definite process. It has long been abundantly clear that the series of events taking place in an inflamed tissue differs in degree only and not in kind from that seen in the reäction to a simple injury. On the other hand, the term inflammation was obviously invented to apply to conditions in which certain well-defined phenomena occurred which are not seen in the direct healing of such a simple wound. Either, then, the term inflammation must be unduly extended to cover processes which it was specially intended to exclude, or we must realise that inflammation is only a clinical term, which needs, indeed, explanation in pathological treatises, but which should certainly not be used as a basis of pathological classification. The essence of inflammation would seem to be chronicity of irritation—it is the reäction of living tissues to a repeated or continuous trauma, such as is caused by invading organism which manufacture a continuous flow of toxine ; but the reäction does not differ from that to a momentary injury. Surely then in our text-books the chapter-heading should be Injury and Repair, and Inflammation should only be a sub-heading for a particular branch of this.

If we turn to our authors, we shall see the difficulties of the common mode of classification ; and we may notice along with them a little book by Dr. Ainley Walker¹ which deals with inflammation and infection. Dr. Sidney Martin defines inflammation as "a reaction of the tissues to the irritant effect of an injury, mechanical, chemical, thermal, or bacterial." He thus includes all tissues, and presumably all the reaction, including repair. In another place we find that he limits the term to vascular tissues, saying that "inflammatory changes have to do with an alteration in the circulation of the blood" (page 17). Yet he admits (page 23) that the cells of the liver undergo mitosis as a direct result of the action of the irritant. This author apparently includes in the inflammatory process the subsequent repair of the injury. This is logical and in accordance with the definition adopted. It is certainly impossible to draw any definite line between the two. Yet it is difficult not to feel with Dr. Lazarus-Barlow that it is doubtful whether any repair takes place while the actual inflammation exists. The latter, therefore, excludes repair from the connotation of inflammation. As the result of a long and able discussion of the phenomena, he comes to the conclusion that inflammation may be defined as "the local portion of that preparation for local repair which is called forth in the living animal body by the action of a subjective or objective irritant upon a vascular part." This is not very helpful to an understanding of the process, and seems to constitute a sufficient proof that the term inflammation should be abandoned as a pathological classification. Dr. Walker, as a faithful disciple of Professor Burdon Sanderson, to whom his book contains a somewhat florid dedication, maintains the well-known definition of inflammation given by his master. Yet he abundantly illustrates the defects of this very definition. It manifestly covers the phenomena which occur in non-vascular tissues, as well as those seen in the presence of blood-vessels, and also embraces repair of injury. Yet we find Dr. Walker maintaining that repair of an injury to the cornea is effected without inflammation, because there is no vascular disturbance and no

¹ *The General Pathology of Inflammation, Infection, and Fever.* Being the Gordon Lectures for 1902. By E. W. AINLEY WALKER, M.A., M.D. (Oxon.), Fellow and Praelector of University College, Oxford, &c. London : H. K. Lewis. 1904. Price 4s. 6d.

migration of leucocytes. On another page repair is stated to be associated with inflammation, and to result when the irritant has been so weakened as to be no longer injurious, but only stimulating.

It has often seemed to us curious how little reference was made to the theory of evolution in any of the sciences which deal with vital phenomena in man. One may read through text-books of physiology and find no mention of this great organic law; and the same is true of works on pathology. Yet it is indubitable that in the course of man's evolution his resistance to disease has been gradually developed, and that diseases have been potent agents in the process of natural selection. One great advantage of the evolutionary point of view is that it enables us to introduce teleological conceptions without the need of invoking supernatural machinery. If a certain process has been perpetuated because it was found useful, then it is no perversion of language to speak of such a process as taking place with a certain object, and this consideration may throw valuable light upon the nature of phenomena. It is no small thing to recognise the use of a process in the animal economy. An example is seen in the exudation which occurs in inflammation, and which serves to dilute and neutralise bacterial toxines. For some reason Dr. Walker goes out of his way to depreciate this knowledge, emphasising the impropriety of teleological explanations. This is only true in so far as we wish to know the "how" as well as the "why" of such things. To realise such a fact as the above does not help us to know how the fluid leaves the vessels, but it nevertheless throws valuable light on the nature of the process of inflammation, showing that instead of being a disease to be combated, it is a salutary process. Since animals are probably in no single instance absolutely suited to their environment, it is likely that inflammation may not be perfectly suited to effect the object to which it is adapted; but it is none the less useful to appreciate its essential nature as a means of defence.

Perhaps the darkest of the corners of the field of pathology is that dealing with the nature of tumours. Dr. Sidney Martin does not devote any attention to this class as a whole, though he throws-in the malignant tumours, sarcoma and carcinoma,

into his chapter on infectious diseases, thus apparently subscribing to the parasitic hypothesis of their formation. He thus separates them from the rest of the tumour-group, which seems an illogical proceeding in default of much stronger evidence than is at present available to support this view. Dr. Lazarus-Barlow is opposed to this theory, and we think that the trend of opinion among those who have devoted themselves to a study of this question is in this direction. The recent discoveries throwing light on the peculiar nature of the cell-division which occurs in tumours are not favourable to an infective origin for these formations. The superficiality of the identification of the spread of a tumour with that of an infectious disease is well brought out by Dr. Lazarus-Barlow.

The greatest advances in the field of pathology have, however, been made recently in the study of the phenomena of immunity and resistance to infection. Indeed this subject has now reached a point of most fascinating complexity, new facts being almost continually discovered, while the laws on which they really depend are not by any means clearly defined. It is well to bear in mind that the well-known diagrams in which Ehrlich's theories are set forth cover considerable lacunæ in actual knowledge. The scaffolding of hypothesis forms a large part of the apparent building of science. An array of rival explanations compete over the comparatively simple phenomenon of agglutination, and the study of immunity to disease presents many more complicated problems. Can it be that we are on the threshold of some far-reaching generalisation in vital chemistry which will embrace many other facts along with those of our conflict with bacteria? The resemblance between the reaction which takes place in the coagulation of the blood, in which the three substances, fibrin, fibrin-ferment, and calcium-salt, are concerned, with that of agglutination, in which cell, agglutinin and sodium chloride are engaged, is very striking. In these, as in haemolysis and bacteriolysis, it seems to be the rule for three bodies at least to take part. Can this complexity of chemical change be a general rule, and may we find in the internal secretions of some of the ductless glands a manufactory of copulas or intermediate bodies the function of which is to enable the cells to assimilate nutrient matter from the surrounding lymph?

Another field in which much recent work has been done is that of the structure of the blood and the changes which it undergoes in various diseases. Yet we are here in the stage of morbid anatomy rather than that of pathology, since the physiology of blood-destruction and regeneration are involved in the greatest obscurity. A very complete work dealing with our knowledge of blood-changes is that written by Professor Ewing,¹ of Cornell University, of which a second edition has now appeared. The facts known as to the behaviour of the different elements of the blood in disease and in response to drugs, as well as the methods employed for investigating these changes, are herein set forth. Drs. Sidney Martin and Lazarus-Barlow also deal fully with the matter. Yet we have to confess that at present we are entirely ignorant of the pathology of so common a condition as chlorotic anaemia, while pernicious anaemia and conditions such as leuchæmia are *terra incognita*. So far the facts discovered as to haemolysis experimentally produced have not thrown any light on the blood-diseases, though the recognised haemolytic power of many bacterial toxines, as well as of snake-venom, makes it probable that a toxic origin will be found in some at all events of the grave forms of anaemia in which there is evidence of destruction of the corpuscles.

With regard to the text-books before us, Dr. Martin's and Dr. Lazarus-Barlow's books are both to be commended to the study of candidates for university degrees and other higher examinations. The former has the advantage of somewhat greater conciseness and more dogmatic teaching, so that it is more suitable for students; the latter possesses a bibliography to each section, which renders it more valuable to those who are studying pathology with a view to research in this field. The discussions on controverted points are full and impartial, and give the reader an opportunity of forming his own opinion on the matters under consideration. We must admit to a little regret that so great an authority as Dr. Sidney Martin should have written what is after all a mere text-book,

¹ *Clinical Pathology of the Blood. A Treatise on the General Principles and Special Applications of Hematology.* By JAMES EWING, A.M., M.D., Professor of Pathology in Cornell University Medical College. Second edition. London: Henry Kimpton. Price 21s. nett.

rather than an authoritative work of reference, with full discussions covering the whole field of pathology and morbid anatomy. Had he done so, we might have possessed a standard English work on pathology. Still we must be grateful for a good, though markedly unequal, book on the lines which he has chosen.

Dr. Walker's little book may be commended to students as a useful study of the limited field with which it deals. We shall look forward to further work on pathology from him in the future, which will carry even higher the reputation which he has already gained as an investigator and teacher of this branch of knowledge. Professor Ewing's manual should be in the hands of all who are interested in the study of the blood in disease.

From the point of view of the ordinary student of medicine we cannot help thinking that two-volume text-books on pathology are more than he requires. On grounds of expense, we cannot expect students to purchase costly volumes on all the subjects of their curriculum. We believe that there is an opportunity for some author to produce a text-book on Morbid Anatomy and Pathology, containing the elements of the science set forth in a dogmatic form, not over-illustrated, and sold at a reasonable price. It should be possible to include in such a volume all that it is requisite for medical students to know with a view to the practice of their profession. No doubt the author would have to face such criticisms as "superficial," "inadequate," "cram book," &c., but in view of the continually-advancing price of the existing books on the subject, as new editions of each come out—the prices varying from fifteen shillings to a guinea—we think that such a book as we have suggested might find an extensive sale.

Reviews of Books.

Diseases of the Gall-bladder and Bile-ducks, including Gall-stones. By A. W. MAYO ROBSON, F.R.C.S., assisted by J. F. DOBSON, M.S., F.R.C.S. Third Edition. 73 illustrations. Pp. 485. London : Baillière, Tindall and Cox. Price 15s.

THE present edition of this standard work is greatly increased in size by copious additions, both to the text, which now runs to 316 pages, as compared with 150 in the first edition, and to the appendix, which contains the epitomised details of 539 cases of operations performed by the author on the gall-bladder and the bile-ducks. A number of fresh illustrations have been added ; these are well executed, and a decided improvement on some of the older figures which are somewhat sketchy. While possessed of an unrivalled personal experience, the author has read widely and has made ample reference to the work of other observers ; the work has, therefore, a double value as a source of reference, and is one which no one interested in the subject can afford to neglect.

St. Bartholomew's Hospital Reports. Vol. XXXIX. Edited by A. E. GARROD, M.D., and W. MCADAM ECCLES, M.S., F.R.C.S. London : Smith, Elder & Co. Price 8s. 6d. (to subscribers 6s.).

AMONG the nineteen articles which, together with the usual statistical tables, make up these *Reports*, there are two of special, because personal, interest, viz., the sympathetic obituary notice of the late Mr. Walsham by Mr. D'Arcy Power, and the account of his own illness (a case of staphylococcal infection) by Sir T. Lauder Brunton. There is a good photograph of Mr. Walsham, who, Mr. Power points out, closely resembled his great predecessor at St. Bartholomew's Hospital — Harvey. In an elaborate paper on Physical Characters and Morbid Proclivities, based on statistics obtained at St. Bartholomew's and Brompton, Dr. Shrubsall attempts to substantiate a correlation between racial types and diseases. The medical report of the Anglo-French Boundary Commission

on the Western frontier of the Gold Coast Colony by the medical officer, Dr. J. G. Forbes, and his further article on Native Methods of Treatment in West Africa, contain much curious information, and are well illustrated by photographs of patients. There are interesting articles by Sir Dyce Duckworth, Drs. Herringham, Weber, Morrice, Calvert, and Messrs. Jessop, D'Arcy Power, and others, to which the reader should refer.

Progressive Medicine. Edited by H. A. HARE, M.D., assisted by H. R. M. LANDIS, M.D. 1903. Vol. IV. Pp. 444. London : Rebman, Ltd. Price 15s. (£2 12s. 6d. for the year.)

THIS final instalment for the year 1903 contains a large amount of material presented in a readable manner and edited with critical care. It opens with an account of the gastro-intestinal tract by Dr. Hemmeter, of the University of Maryland, Baltimore, who treats the subject from the physician's point of view, and thus supplements Dr. Coley's article on the subject in a previous instalment of *Progressive Medicine*, which was naturally on surgical lines. Mr. Bloodgood, of the Johns Hopkins Hospital, contributes a surgical review of anæsthetics, fractures, dislocations, amputations and orthopaedics which is copiously illustrated and contains some good skiagrams. The articles on Genito-urinary Diseases by Dr. Belfield, and on Diseases of the Kidney by Dr. Rose Bradford, very appropriately come next to each other, as to a certain extent they cover the same ground, from surgical and medical points of view respectively. Dr. Brubaker reviews the progress of Physiology, Dr. Harrington deals with Hygiene, and the volume concludes with an article on Therapeutics by Dr. Landis.

Transactions of the Association of American Physicians.
Vol. XVIII. Philadelphia.

THIS volume of transactions contains many interesting articles, all of which we have not space to mention. Attention may be called to Professor Osler's description of a new disease, "Chronic Cyanosis with Polycythæmia and enlarged Spleen"; to Dr. Dane's cases of Acute bulbar Paralysis; and to Dr. Barker's article on Hereditary Ataxia, from the clinical point of view. Of pathological interest are Dr. Pearce's paper on "An

"Experimental Study of Nephrotoxins," Dr. Smith's Studies on Tubercle-bacilli, and Dr. Trudeau's contribution on "Artificial Immunity in experimental Tuberculosis." Some practical advice on the treatment of Migraine is given by Dr. Rachford. Two papers of importance dealing with the action of alcohol in disease are also worthy of study—one from the pen of Dr. Hare, the other by Dr. Cabot. The whole volume bears testimony to the activity of our American colleagues in all parts of the field of medicine.

The Medical Society's Transactions, Vol. XXVI. Edited by JONATHAN HUTCHINSON, Jr., F.R.C.S., and HENRY ALBERT CALEY, M.D., F.R.C.P. London.

THIS record of a year's work contains much interesting reading, and testifies to the energy of the officers and members of the Medical Society. Dr. Leigh Canney's well-known views on the prevention of Typhoid Fever are set forth at length, and are followed by a useful discussion. Mr. Mayo Robson deals with the surgical treatment of Haematemesis, and Dr. Risien Russell and Sir V. Horsley with the treatment of Epilepsy. Herein, too, are Dr. R. Crocker's Lettsomian Lectures on "Conditions which modify the Character of Inflammations of the Skin"; and an important discussion, opened by Mr. Watson Cheyne, on the "Treatment of Cancer of the Rectum." Many interesting single cases are also recorded.

A Manual of Obstetrics. By A. F. A. KING, A.M., M.D., Professor of Obstetrics, Columbian University, &c. 9th Edition. London : Henry Kimpton.

NO detailed criticism is demanded by the ninth edition of this well-known manual. The author has made such additions and changes as the progressive development of obstetric science has seemed to him to require. Some errors have been corrected and obsolete methods of practice omitted. The chapter on Puerperal Septicæmia has been remodelled and, for the most part, re-written. Some of the older illustrations have been replaced by newer figures selected from recent works. This edition will doubtless be appreciated even more than its predecessors.



Notes by the Way.

Shellfish and Sewage.

THE recent Report of the Royal Commission on Sewage Disposal¹ dealing with the question of the dangers which are incurred through the pollution of shellfish in tidal estuaries by sewage material, is a valuable document which deserves close attention. There is no room for doubt, in the light of the recent occurrence of outbreaks of enteric fever as the result of eating oysters, that there is a serious risk of the spread of disease by means of these molluscs, and there is accumulating evidence that cockles and mussels may also be responsible for some of the cases of enterica which are met with in the holiday season when these delicacies are largely consumed. All these varieties of shellfish are exposed to contamination in the same way, growing as they do under very similar conditions on our coasts, so that they may be considered together from a public-health point of view. It is high time that legislation for the prevention of pollution of the "layings" of either cockles, mussels, or oysters was undertaken as a protection to the community against what is now a serious peril.

The Growth of Oysters.

* * * * *

IN a natural state the oyster produces a progeny of one or two millions of young, but this apparent extravagance on the part of Nature is merely adapted to ensure the survival of a sufficient number of the young oysters against the manifold dangers by which they are surrounded in the early stages of their career. The great majority of the embryos fall victims to predatory fish or die from inability to find a suitable resting-place on the sea bottom. The objects of artificial oyster-culture are to provide against the perils to which the young oysters are naturally exposed, and thus to ensure the survival of a much greater proportion of the whole progeny of each

¹ *Fourth Report: Pollution of Tidal Waters, with Special Reference to Contamination of Shellfish.* Vol. I., Report, 1904.

oyster than would otherwise come to maturity. For this purpose the parent molluscs are kept in special tanks, and the embryos are furnished with comfortable materials on which to settle and attach themselves. This they do on any clean surface, but that generally used is earthenware tiles. When they have grown to a suitable size, the young oysters are transferred to another abode, in the shape of shallow pits on the coast, in which they fatten and grow to the size proper for market. From these layings they are often taken and stored for a time in bulk in pits situated in convenient localities for purposes of transport near to some railway. There is as a rule no danger of contamination of the young oysters in the place of their birth and childhood, if it may be so called. It is in the layings where the fattening takes place, and occasionally in the places of storage, that they are liable to be brought into contact with sewage, and it is these oyster-beds which need careful inspection by some health-authority to ensure their sanitary safety.

* * * *

**Evidence of
Contamination in
Oysters.**

As the proof of the pudding is in the eating, so unfortunately the most definite proof of the contamination of an oyster is to be found in the attack of illness which follows its consumption.

Of this kind of evidence there is sufficient ready to hand. The Commissioners quote the striking cases of the two mayoral banquets at which oysters from one source were the only common feature, each of the entertainments being followed by a crop of cases of enteric fever. The matter was most clearly worked out by Dr. Timbrell Bulstrode, the greatest authority on the contamination of shellfish in this country, and he proved in the cases of all the individuals affected with illness after the dinners that oysters were the common dish of which they had all partaken. But in the case of oysters yet uneaten, it is not a very easy matter to prove the existence of pollution. It has generally been considered sufficient to examine the fluid contained within the shell of the oyster in the pallial chamber, and to discover whether any colonies of the *Bacillus coli* can be grown from this. There appears to be a double source of fallacy in this procedure. In the first place it is possible for the

bacilli to be present in the body of the oyster, though there are none discoverable in the pallial fluid. Dr. Houston, quoted by the Commissioners, has found that the stomach of the animal usually contains more of these organisms than the outer fluid. On the other hand it does not seem certain that the mere presence of *Bacillus coli* is a proof that contamination by sewage has taken place. The bacillus is very widely spread abroad in the animal kingdom, as is proved by the researches of Dr. J. W. Eyre,¹ who has examined birds, beasts, and fishes, and finds that *Bacillus coli* may occur in all species so far investigated. If birds and fishes may normally contain colon-bacilli, it is evident that the presence of such bacteria in oysters does not necessarily prove that they are polluted with sewage. The value of bacteriological examination as a test of the wholesomeness of shellfish is therefore at present doubtful, and no other has been discovered to take its place. A contaminated mollusc looks just as inviting as one which has grown under more sanitary circumstances. Hence the only way to protect consumers of these "fish"—for perhaps now that the lobster has been diplomatically "raised to the dignity of a fish," oysters and cockles are also to be ranked as such—is to ensure that the layings are situated in places where there is no possibility of pollution with sewage material.

* * * * *

**Means of
Preventing
Pollution.**

To accomplish the above object two alternative courses are possible. On the one hand we might enact legislation to prevent the discharge of crude sewage into tidal waters,

as we already do in the case of rivers. Against this course there is to be set the great expense which would be involved in the purification of the sewage from all seaside towns which at present drain into the sea. In the great majority of instances no harm is done, the sea being large enough to receive and do away with much sewage material when the drains can be arranged to open in suitable places. It is also necessary to bear in mind that even purified sewage—the clear effluent derived after filtration and precipitation—swarms with bacteria belonging to the colon-group, and it is doubtful

¹ *The Lancet*, March 5, 1904, p. 648.

whether much would be gained by insisting on the treatment of sewage in the neighbourhood of beds of shellfish if the effluent were allowed to flow into the surrounding water. The other alternative is to exercise supervision over the layings, by means of a system of inspection and licensing, making it a penal offence to offer oysters or other shellfish for sale if taken from an unlicensed bed. This is the course recommended by the Commissioners, and it certainly seems the most hopeful.

* * * *

The State of the Law.

AT the present time the law gives little assistance in the direction of either remedy suggested in the last note. In the absence of a satisfactory test for contamination, it would be difficult to get shellfish from a polluted spot condemned as unfit for food; and even if this were possible in the case of a particular consignment, the order would not apply to others coming from the same locality. On the other hand it has been held that existing legislation with regard to the discharge of crude sewage into rivers does not apply to tidal estuaries, so that there is no means of restraining local authorities from discharging any amount of dangerous material into the sea or into the mouths of rivers, and for reasons of convenience it is generally at the last-mentioned spots that oyster-beds are situated.

* * * *

Foreign Oysters. To guard against risks of disease from

oysters imported from foreign countries the Commissioners suggest that certificates should be exacted, in respect of all imported oysters, from the Government of the exporting country, stating that the molluscs come from unpolluted sources. Some foreign countries already issue such certificates. In France considerable care is apparently taken to ensure freedom of oyster-beds from contamination; but according to evidence given before the Commission, in Holland and Portugal some layings are definitely known to be liable to sewage contamination, and shellfish from these places are at times imported into this country. In the case of oysters brought from a contaminated spot and placed for fattening or

storage in pure water, the question arises as to how long the pathogenic bacteria will remain virulent. It does not appear that any certain knowledge upon this point has been obtained. Some of the witnesses before the Commission appeared to think that the oyster had some power of ridding itself of bacteria if it were laid in clean water. On the other hand, Prof. Klein leaned towards the view that it might be possible for these fungi to multiply within the body of the shellfish, and that this was especially possible in the case of the *Bacillus typhosus*. More experiments on this point are much to be desired.

* * * * *

Dust-Disposal. If the disposal of sewage is a matter of urgent importance from the point of view of public health, that of dust and other household refuse is a scarcely less pressing subject for consideration in our towns. The ultimate fate of this kind of "matter in the wrong place" does not indeed thrust itself upon the average citizen as a matter of urgency, but the present means of collecting what is classed as "dust" does obtrude itself upon all those who witness it in London as a most pestiferous process. To witness the shooting of a receptacleful of dust, ashes, and other unsavoury refuse from a tin bin on to a piled-up heap of similar matter on a cart already loaded to the brim, when there is a fairly strong breeze blowing, is to see a sight which gives a vivid impression of the beauties of civilised contrivances for propagating disease. It is a disgusting sight even for one standing to windward, while to anyone who has the misfortune to come within a radius of thirty yards on the leeward side the experience is indescribably revolting. It should hardly be beyond the range of human ingenuity to devise a less insanitary mode of removing refuse. It has been suggested that each house should be provided with two metal receptacles for dust, one of which should be taken away at each visit of the dustman and the other restored in its place. No attempt seems to have been made to carry out this plan, which seems to be considered impossible of execution. Yet the saving of time effected should go some way to compensate for the greater cart-space required for the purpose of carrying the bins instead of a mere heap of refuse. At any rate the present methods of dust-collecting are a danger to the

health of the community, and serious attention should be devoted to the problem of improving the procedure.

* * * * *

An Ambulance Service for London.

IN reference to our note of last month upon this subject, a correspondent writes suggesting that the fire brigade stations should be utilised as centres for the establishment of ambulances. The two most obvious positions for keeping ambulances would be the police stations and the fire stations, though we do not know what accommodation would be available at the latter. In case of accidents the police are naturally appealed to for assistance, and it would seem easy to keep hand-ambulances at the police stations for use in such emergencies. The problem of establishing horse-ambulances is rather more difficult, as much more extensive accommodation would be required. It seems doubtful whether this could be obtained at the fire stations as they exist at present. The matter is one into which the new County Council should lose no time in enquiring, as the need for some solution of the problem is very evident.

* * * * *

The Recrudescence of Small-pox.

THE recent addition of chicken-pox to the list of notifiable diseases in the County of London reminds us of the fact that there have been a certain number of cases of small-pox in the Metropolis in the last few weeks. There is at present, however, no reason to fear that anything like the epidemic of two years ago is likely to be expected. In spite of the existence of "conscientious objectors," and the resulting advertisement given to a certain number of faddists, the returns as to vaccinations are more favourable than they were before the passage of the last Vaccination Act. It is no doubt regrettable that it should be necessary to provide for the vagaries of cranks in legislating for the country at large, but at any rate the effect of the Act has been to show that a very minute proportion of the whole population are sufficiently misled by ignorant agitators to insist on refusing protection by vaccination when such refusal actually costs them a little expenditure of trouble. We hope that before long some measures will be taken by local

authorities to control the present freedom possessed by infected vagrants to spread disease of all kinds, and notably small-pox, throughout the country as they wander from one place to another. Attention has been repeatedly called to this means of the propagation of small-pox, and instances of such conveyance of the disease have come under the observation of most sanitary officers. It is to be hoped that medical officers of health will lose no opportunity of impressing the existence of this danger on their local authorities, and of agitating for the adoption of collective measures for its abatement.

* * * * *

**Parks
and Parasites.**

ANOTHER aspect of the tramp - nuisance which has been somewhat prominently brought before the public lately in the columns of the daily press, is the invasion of our parks by undesirable and unsavoury loafers. The extent of the evil is only too obvious. Owing to the filthy condition of many of these vagrants the seats in the parks are rendered unsafe for the use of respectable persons, and the grass in places is dangerous to walk on, from the risk of contamination with vermin. It is not, however, very easy to propose a remedy for this state of things. In this country of liberty and equality, our public gardens are free to all ; and though it should be possible to exclude obviously verminous persons as we should those infected with other forms of disease, yet the examination necessary to establish the existence of the condition might be difficult to carry out on the spot. It is time that the whole tramp-question was dealt with by legislation, for the number of vagrants scattered throughout the country constitutes a serious danger. The community at large is greatly responsible for the existence of the evil, owing to the habit of extending promiscuous charity to casual applicants. But the workhouse system is also unsatisfactory : the house is too comfortable and the work too light. More rigorous measures should be taken to make the tramp's life less attractive than at present, and thus to reduce the numbers of those who take to "the road."

* * * * *

An International
Congress of
Ophthalmology.

THE Tenth International Congress of Ophthalmology will be held in Lucerne during September 13-17 of this year. The subscription to the Congress is 25 francs, which entitles the ticket-holder to a copy of the *Proceedings* subsequently published. The London Secretary is Mr. W. H. Jessop, while Scotland and Ireland are represented by Mr. George Mackay and Mr. H. R. Swanzy respectively. Many of the best-known ophthalmologists of the Continent are on the committee which presides over the arrangements for the meeting, to which we wish all possible success.

THE PRACTITIONER.

J U N E, 1904.

MEDITERRANEAN FEVER IN EGYPT.

By F. M. SANDWITH, M.D., F.R.C.P.,

Consulting Physician to Kasr-el-Ainy Hospital, Cairo.

Synonyms.—Malta fever, Gibraltar fever, Rock fever; Neapolitan, Cretan, Cyprus, Danube, Levant fever; Undulant fever. The foregoing terms are still used, while the following have been employed of late years though they have nothing to commend them: Gastric remittent, bilious remittent, intermittent typhoid, typho-malarial, faeco-malarial, sewage, and cesspool fever.

DEFINITION.

An endemic, specific fever, sometimes becoming epidemic, with long, indefinite duration, and a tendency to long wavy relapses; characterised by constipation, profuse sweats, anaemia, debility, neuralgia, and sometimes rheumatic sciatica or swelling of joints. The disease is dependent on a specific microbe, but is not directly contagious, and is attended by a low mortality.

HISTORY.

Hippocrates wrote of long fevers occurring on the coast of Greece with as many as four lengthy relapses, and on one occasion death on the 120th day; but it was not until 1859 that this disease was first described as a specific illness. In 1886 Bruce found the *Micrococcus melitensis*, which he named after the island of Malta; but, unfortunately, the disease is still much confounded with malarial and enteric fevers.

DISTRIBUTION.

Besides the places which have given this fever the above-mentioned names, it is known in other sea-ports of Italy, in Sicily, Sardinia, Constantinople, Tunis and Algiers. But recent experience has shown that "Mediterranean fever" is by no means a sufficient name, for it occurs on the Red Sea Coast

at Suakin, Massowa and Zanzibar ; in India in the Punjab, at Simla, Delhi, Agra, Allahabad, and in Assam ; at Hong Kong, at Porto Rico, and in the West Indies and Philippine Islands.

This fever was never recorded in Egypt until I recognised a case in November, 1883, in a young English lady who had travelled leisurely through Italy on her way to Cairo. Her symptoms were similar to the disease which I had had opportunities of studying in Gibraltar and Malta ; quinine in doses of 40 grains daily had no effect upon the temperature, which lasted for 100 days ; and an additional argument against its having been enterica is that the patient underwent an attack of the latter in Cairo a year later. Since then many English soldiers have brought the disease with them from Malta and Gibraltar, and have been treated in the Military Hospital. In 1897, for instance, two battalions from Malta furnished eight cases in Cairo and five in Alexandria. During the last three years two residents of Cairo have developed the disease in Egypt on their return from England in the autumn.

But the Egyptian record is not confined to imported cases, for occasional sporadic instances occurring in the country have been seen among Europeans at Port Said, Alexandria and Suez ; and Mr. H. Milton has seen one case (proved by the serum-test) in an Egyptian who had come from Mit Gamr to Cairo, and had never in his life been out of Egypt or even as far as Alexandria. Captain Rivers, R.A.M.C., while on duty at Kassala during one year saw four cases among Abyssinian regular soldiers who had apparently caught the fever in the Kassala district ; all four cases occurred between June and September, *i.e.* during or after the annual rains. There is much malaria at Kassala at this time of the year, but haematozoa could never be found in these four cases, and they proved quite refractory to quinine by mouth or needle.

CAUSES.

The disease is due to the entrance into the body of the specific micrococcus ; but it is still a moot point whether the infection is air-borne from faecal dust, or water-borne to the victim's mouth. Possibly, as in the case of enteric fever, both methods coexist. Three predisposing causes are believed to be essential—a sea-coast or large river, exposure to sewage,

and hot weather. It will be noticed that nearly all the parts of the world from which the disease has been reported are on sea-coasts, or in islands, or on the banks of large rivers. It is also well known on ships in various harbours where sailors are exposed to sewage all round them. There can be little doubt that it is a filth-disease ; and many authorities believe that the microbe is able to exist in the soil, but is apparently not present in clean earth. The disease has not been eradicated from Malta and other places, in spite of improved sanitation ; but this is perhaps due to the fact that the old rock sewers have not been abolished, and that the hygienic measures have not been sufficiently thorough. On the other hand, the "Rock-fever," for which Gibraltar used to be so notorious, is said to have decreased the last twenty years in the proportion of about 90 per cent. This improvement is apparently due to better sanitation, such as the lengthening of the main sewer, the greater attention paid to house-drainage, street-paving and scavenging, stricter supervision of food and milk-supplies, and, most important of all, the formation of reservoirs in the rock for supplying all the inhabitants with pure filtered rain-water.

The season of greatest prevalence is from June to September, while the coldest months from December to February furnish the fewest cases. At Malta the patients occur mostly when the rock sewers are undergoing a process of drying after the rains.

Though this fever is not contagious from one patient to another, inoculation experiments have proved that men and animals can be infected through the skin. It has, therefore, been suggested that it is an insect-borne disease, like malaria. It occurs most commonly between the ages of six and thirty, and equally affects both sexes and all stations in life, but attacks strangers more than natives. Residence in an infected area does not confer immunity, though this may be gained, at least for several years, by an attack of the fever.

VARIETIES.

There are two types of the disease with which the student must be familiar :—

(1) The intermittent, which may produce a temperature-chart exactly similar to that of a patient suffering from tubercle

or deep-seated pus, or may show occasional very short waves of pyrexial intensity ; and (2) the undulant, which caused Hughes to suggest this name for the disease.

SYMPTOMS AND COURSE.

Obstinate constipation, extreme anaemia, debility, and enlargement of the spleen are the only certain symptoms which accompany the fever. The indefinite duration of the temperature distinguishes this from all other fevers, for in severe cases the pyrexia may last for six months and convalescence not be completed for two years. The average stay of soldiers in hospital is from seventy to ninety days. The fever is characterised by intermittent waves of more or less remittent type, each wave lasting from one to three weeks, with generally an interval without fever of two or three days. The waves may vary in number from one to seven, the average being three. The length of the wave is usually from ten to fifteen days, but it may be as short as three days, or as long as fifty.

The temperature in my cases has generally reached 40° C., but seldom goes above it. The highest record on my charts is 40.5° . Many patients develop a tendency to enteritis, but Peyer's patches and the mesenteric glands are never involved. Profuse sweating is often present, and accounts for various names given to the disease by the Italians—*febris sudoralis*, &c. Emaciation and loss of hair are necessary results of the prolonged fever.

COMPLICATIONS AND SEQUELÆ.

The most common complications are rheumatoid affections of the joints, such as the hips, knees, or shoulders ; sciatica ; and respiratory diseases, including bronchitis, pleurisy, and pneumonia. These last, together with hectic fever and sweats, present a picture which is often suspiciously like tuberculosis.

The following cases illustrate the length of the disease, the tendency to relapses, and the fact that the personal equation will modify the poison and produce in two members of a family very different complications :—

Case 1.—An English lady, æt. 40, stayed at an hotel in Malta from April 6 to 15, 1896, and then slept for one night

in Syracuse upon her return to London. About May 1 she felt ill for the first time, but it was not recognised that she had fever until May 19, when she was put to bed and kept there till July 27, suffering from insomnia, constipation, want of appetite, profuse sweats, loss of hair, anaemia, and emaciation. On May 26, three days of apyrexia began; then followed a week exhibiting temperature of 38° (a.m.) to 39° (p.m.); then six afternoons when the thermometer reached 40° ; then a gradual descent of both morning and evening temperatures until June 18, when pneumonia of the right lung occurred, ending by lysis ten days later. The temperature only remained normal for four days, and then showed another wave of fever from July 2 to July 20, and again a miniature wave from August 1 to 7. The sixth and last wave on the chart was a serious one, lasting from September 15 to the middle of October. The patient remained weak and anaemic in spite of various changes of climate until December 20, when she had a dangerous attack of acute bronchitis lasting three weeks. She had, until her unfortunate trip to Malta, always been a very strong, healthy woman, and had never had any bronchitis before, so that this attack seemed to be a distinct sequel of the fever and pneumonia. In February, 1897, she was sent to Cairo, where I found that she was still suffering from anaemia, inability to walk, loss of weight, some lividity of the face and hands, much cough and expectoration, many bronchitis signs in both lungs, and dulness at the right base.

In May she was able to return to England quite well, one year after the beginning of the illness, and she has remained in good health ever since. It is to be noted that she never had any rheumatic symptoms. During the fever she had some transient erythematous patches on the skin of the back, sides, abdomen, and face.

Case 2.—A boy, aged 12, accompanied his mother (Case 1), and was therefore exposed to the poison in Malta or Syracuse, in April. He remained apparently quite well, and was not known to suffer from fever until July 18, when at school his temperature was found to be 40° , and there was some vomiting, diarrhoea, and urticaria, at first supposed to be due to eating overripe fruit. But when the fever continued, and was found to be accompanied by no symptoms, except constipation and

an enlarged spleen, the disease, like his mother's, was called Mediterranean fever. His temperature may have been somewhat modified by quinine, arsenic, salicin, and phenacetin ; but for two months and a half the evening rise ranged from 38° to 39.5° , occasionally reaching 40° , while the morning temperature varied from normal to 39° . The chart showed a continuous intermittent range, with a slight tendency to waves, but without periods of normal evening temperature between them. This continued fever produced emaciation, great weakness, and depression of spirits. In September there was an improvement in temperature and gain of strength ; but in the middle of October, soon after the temperature had become normal, acute rheumatism in the right knee occurred for the first time as a further confirmation of the diagnosis. Between October and January he had five similar attacks of fever and rheumatism in the right thigh. At the end of February, while on the Riviera, he had an attack of fever for eight days, rising as high as 40.2° , but no rheumatism, and in March he was brought to Cairo, to be under my care. His splenic dulness then measured $4\frac{1}{2}$ inches ; but his anaemia and constipation yielded easily to treatment, and he was soon strong enough to play golf for half an hour a day. On April 11, just a year after the origin of the illness, I thought him well enough to join a donkey picnic in the desert, but this exertion was followed by five days' fever, without rheumatism. The fever was the shortest bout he had ever had, and disappeared the day after he took some quinine. I gave the quinine in three doses, each of half a gramme, at 8, 10, and 12 in the morning, a method which answers well in other fevers when the morning temperature is low. When this patient first reached Cairo I found that his urine was extremely acid, high-coloured, and of specific gravity 1024-1026, but without albumen ; and I therefore made him drink large quantities of Contrexèville water. During his attack of fever there was no albuminuria ; but for a month afterwards there was always albumen after meals, though none before food. At the end of May he returned to England with a splenic dulness of 3 inches, without fever, rheumatism, or albuminuria, and able to walk several miles without fatigue ; and since then he has always remained well. The only reason which I can suggest for the great difference in his complication

to his mother's, is that he inherited a distinct uric-acid diathesis which his mother did not. I should add that his blood never showed any evidence of malaria.

MORBID ANATOMY.

The autopsies at which I have been present displayed changes similar to those which I have studied at Malta. The spleen is enlarged, hyperæmic and soft, weighing from 11 to 30 ounces. The liver is generally a little large and congested. The lungs usually show hypostatic congestion, and the kidneys are also hyperæmic. The small and large intestines are congested, often in patches; there is no swelling or ulceration of solitary glands or Peyer's patches, nor is there in ordinary cases any enlargement of the mesenteric glands.

DIAGNOSIS.

Mild cases, with little fever, are often overlooked and treated at first as dyspepsia or debility. In countries where malaria is prevalent that disease can be negatived by the absence of parasites in the blood, and the unchanged condition after quinine.

From the hectic fever of tuberculosis or liver-abscess, we must rely for diagnosis upon local symptoms, bearing in mind that phthisis is not an uncommon sequela of Mediterranean fever. The effusion into joints and neuritis must be distinguished from acute rheumatism, synovitis and neuralgia.

But the chief difficulty in diagnosis occurs in the beginning of a case when enteric fever is suspected; the milder and longer course of the disease, the absence of eruption, the profuse sweats, the extremely remittent or intermittent type of fever, and very often the rheumatoid symptoms, help one to diagnose Mediterranean fever, especially if the illness began on some sea-coast where it is known to exist.

Of late years serum-diagnosis has been of the greatest help, and seldom fails to distinguish this fever from enteric. I am indebted to Major D. V. O'Connell, R.A.M.C., for the details of the methods satisfactorily used at Malta for the last five years. Both methods of obtaining serum are equally efficient, but the former is the more rapid, provided a centrifugal machine is available.

(1.) A drop of blood is drawn, preferably from the lobe of the ear, into an ordinary vaccine-lymph tube, both ends of which are then sealed by heat. On being brought to the laboratory the ends are broken off and the capillary tube is put into a test-tube about $2\frac{1}{2}$ inches long. Ten or more drops of distilled water are added to dilute it, and the tube is then put into a centrifugal machine, which is whirled for about two minutes ; the watery fluid resulting from this is the diluted serum required for the test. A drop of it is taken up with the capillary tube and placed on a clean slide. Then with a sterilised platinum needle a very small quantity of the active growth of the *M. melitensis* on agar-agar is taken up and mixed thoroughly with the diluted serum on the slide, the mixing being done with the platinum needle, which is subsequently sterilised in the gas flame. A cover-slip is then put on the slide, which must be examined with a low power (one sixth).

In some cases clumping is immediately seen, but in others you must wait about half an hour. If the clumping does not then occur, no reaction will occur at all, owing either to the case not being one of Mediterranean fever or because a too diluted serum has been used. The least amount of dilution which is satisfactory is 1 in 20, but in most cases a dilution of from 1 in 40 to 1 in 200 will produce the clumping.

(2.) A small blister may be made with blistering fluid on the upper arm, about the size of a two-shilling piece. In twelve hours a large quantity of serum can be obtained in capillary tubes from this, and a drop of it can be diluted and centrifuged as above ; this serum is quite as effective as that obtained directly from the blood.

To obtain the reaction with certainty, the patient should have had the fever for at least a week or ten days. Cases with high temperature usually clump quickly.

PROGNOSIS.

The mortality does not usually exceed 2 per cent., the majority of deaths occurring during the first six weeks of the attack. The pyrexia averages about 60 days, but may vary from 14 to 300 days. Excessive diarrhoea, vomiting, and concurrent exhausting diseases are all dangerous.

A sub-normal temperature lasting for a few days, accompanied by a perfectly clean tongue and returning appetite, are the surest signs of approaching convalescence.

TREATMENT.

The patient must be removed from any insanitary surroundings, and be treated in every way as a case of enteric fever, until the diagnosis of the latter is excluded. He must be confined to bed so long as acute symptoms persist, and the drug-treatment must be entirely symptomatic. The diet must be graduated according to the height of the fever and the condition of the tongue. The rheumatic symptoms will require flannel clothing and cotton-wool ; and the patient should sleep between blankets. Open-air treatment will help convalescence, and patients should be sent to a warm climate for the winter months, though they should not be allowed to travel during the acute stages.

Prevention.—Sanitary houses and carefully chosen camps for troops are all-important. Special care should be taken to avoid the bites of insects wherever this fever is prevalent. The urine and faeces must be rigorously disinfected, and every care taken with regard to water supply and general hygiene.

REFERENCES.

- Hughes : *Mediterranean, Malta, or Undulant Fever*, London, 1897. "Undulant (Malta) Fever," *Journ. Trop. Med.*, March, 1899.
Zammit : "Mediterranean Fever," *Malta Arch. and Scien. Soc.*, May, 1902.
Hislop : "Geographical Distribution of Malta Fever," *Brit. Med. Journ.*, September 20, 1902.



THE DIETETIC TREATMENT OF DIABETES.

By ROBERT HUTCHISON, M.D. (EDIN.), F.R.C.P. (LOND.),

*Assistant Physician to the London Hospital, and to the Hospital for Sick Children,
Great Ormond Street.*

WITH the exception perhaps of obesity there is no disease the treatment of which must proceed on more strictly dietetic lines than that of diabetes. At the outset, however, a supposed objection to such a method of treatment must be disposed of. I have often heard intelligent students argue thus:—“Diabetes is an incurable disease; what then is the use of dieting the patient? By doing so you merely suppress one of his symptoms (*glycosuria*) without doing anything to strike at the root of the malady.” This line of argument, at first sight so cogent, is really fallacious. In the first place we do not know that diabetes really is, in every case, incurable. It is probable that only a small proportion of the subjects of the disease ever come under medical observation. There is reason to believe that many people suffer from diabetes in a slight degree without knowing it; and if such cases could be recognised early and treated efficiently, it may well be that they would never pass on into the full-blown stage of the malady. Further, there are a great many mild cases, especially in elderly people, that, under suitable dietetic management, may go on comfortably for an indefinite period, but which, if neglected, develop complications which may lead to a speedily fatal issue.

But there are even stronger reasons which justify dietetic treatment in this affection. Most of the symptoms of diabetes are due to the presence of sugar in the blood; the disease itself is marked by two symptoms only — wasting and weakness. Practically all the other symptoms and complications are due to the irritating effects of sugar on the tissues or to the necessity for its elimination in solution through the kidneys. From the former there result such symptoms as

neuritis, perforating ulcer, cataract and retinitis, and from the latter polyuria and thirst. The saccharine blood, too, would seem to offer a very suitable medium for the growth of microorganisms ; whence ensue such complications as boils, carbuncles, gangrenes, and phthisis. By ridding the blood of its excess of sugar, these symptoms and complications can be warded off if not yet present, or ameliorated if they already exist.

But there is an even stronger reason than this for removing sugar from the blood as far as possible. Whatever the true pathology of diabetes may be, everyone is agreed that in the last resort it must be regarded as a condition in which the sugar-assimilating function of the tissues is more or less impaired. Now this, like any other impairment of function, is improved by rest and still further deteriorated by over-work. But if the blood is freed from sugar, such rest is assured ; whilst on the other hand, if the cells are flooded with sugar, their overwork is equally inevitable. By strict dieting, then, the power of the tissues to deal with sugar is recuperated ; and in consequence we find that a patient who prior to a period of strict diet was unable to assimilate any sugar at all, is often able after it to take considerable quantities with impunity.

For all these reasons, therefore, we may proceed with a clear conscience to our dietetic treatment of the disease, feeling that at least we are doing thereby all that can be done to relieve our patient's sufferings and to prolong his life.

Before proceeding further one other preliminary point must be dealt with, and that is the question of terminology. Much confusion has resulted from the use of two words—"diabetes" and "glycosuria." For the purposes of this article I intend to signify by the word "diabetes" a permanent glycosuria, no matter how caused. Whether the permanent glycosuria of elderly, and often gouty, persons is or is not of different causation from the more severe form met with in young subjects, does not concern us here ; from a dietetic point of view both must be managed on the same lines. This distinction only would I emphasise—that the younger the subject, the more continuous, energetic and careful should our treatment be ;

whilst the older the patient, the greater is the degree of laxity permissible.

CLASSIFICATION OF CASES.

Let us suppose, then, that we have to deal with an individual whom we have discovered to be the subject of persistent glycosuria, *i.e.* of diabetes. How are we to set about adjusting his diet? Now the wrong thing, in my judgment, to do, would be to sit down and draw up for him a list of foods which are free from carbohydrates, and tell him that he may eat those; and another list of starchy and saccharin articles, and forbid him those. In other words my point is this—that there is no routine “diabetic diet,” but every case must be dealt with according to its own peculiarities. The main reason for this is that all cases of diabetes are not of the same degree of severity. In one the patient’s power of assimilating sugar is nil; in another it falls but little short of that of health. Hence the first step we have to take is to find out what our patient’s “tolerance” for carbohydrates really is; and to do that we must put him on a “test-diet.” The simplest form of test-diet is one which consists of a moderate amount of animal food—excluding milk—and a known quantity of carbohydrate-containing material, say 4 ounces of bread. After three days of such a diet the patient’s total output of sugar in one day is estimated, and the amount compared with that of the carbohydrates in the bread. Now 4 ounces of bread contain an amount of carbohydrate equal to 66 grammes of sugar. If, then, the patient excretes *less* sugar than that he must obviously have some degree of “tolerance”; but if more than that then his tolerance is nil. The former case may be spoken of as a comparatively mild, and the latter as a severe one; and by varying the quantity of bread it is easy to ascertain what is the exact degree of failure of assimilation in any given case.

Proceeding thus we can divide cases of diabetes roughly into two groups:—

1. *Mild cases*, in which some tolerance of carbohydrates still exists, the degree of mildness varying directly with that of tolerance.

2. *Severe cases*, in which there is no tolerance of carbohydrates at all.

And these two groups must be dieted on different lines.

DIET IN MILD CASES.

Suppose we find by a test-diet that our patient begins to excrete sugar if he is allowed 4 ounces of bread, but that on quantities less than that his urine is sugar-free. We ought then to allow him a diet which contains considerably less carbohydrate than that which we have found him capable of dealing with, for it is never safe to feed a diabetic patient up to the limit of his powers of assimilation. In this case we might safely allow him 2 ounces of bread along with abundance of the carbohydrate-free foods described below; and continue such a diet so long as his weight and general condition remained satisfactory. From time to time, however—say twice a year—such a case should be subjected to a period of perfectly strict diet in order to give his carbohydrate-assimilating functions a complete rest.

DIET IN SEVERE CASES.

If a test-diet has shown that the patient excretes more carbohydrate than he takes in, we must proceed much more cautiously. The next step in such a case is to examine the urine carefully for oxy-butyric acid and its allies. The easiest way of doing so is by the "perchloride of iron" test.

i. If the addition of a few drops of solution of perchloride of iron causes the urine to assume a dark port-wine colour, any change of diet should be made very gradually, for such a patient is always in danger of coma, and the coma may apparently be precipitated by any sudden change in dietetic habits. The carbohydrates in the diet should therefore be reduced very slowly, and bicarbonate of soda should be administered at the same time in quantities of from $\frac{1}{2}$ to 1 ounce daily. Proceeding thus one can often get the patient gradually on to the diet of pure proteid and fat described below. Not infrequently, however, one meets with difficulty. The sugar-excretion may remain high, and the patient's weight and general condition may deteriorate, or coma may threaten. If

things shape thus, it is best to abandon all attempts at a rigid diet, and to allow a definite quantity of carbohydrate in the form of bread and milk. For it must never be forgotten that in some of these severe or, as Dr. Pavý calls them, "composite" cases, proteid is as harmful in the direction of increasing the amount of sugar in the blood as carbohydrates. Even where everything is going well, it is not advisable, when one is dealing with this type of the disease, to give more than 500 grammes of cooked meat a day, or its equivalent in other forms of nitrogenous food.¹ In many such cases one must reluctantly abandon all attempts to keep the blood sugar-free, and be satisfied if the output of sugar does not rise above 100 grammes per day.

2. If the perchloride-reaction is negative, one can proceed to a strict diet without much anxiety. Whether this should be done suddenly or gradually is a matter of choice. For my own part I think it is better, provided the patient can spare the time, to proceed gradually. One would begin by eliminating from the diet sugar and all the grosser forms of carbohydrate ; then the farinaceous foods ; then bread, and finally even milk, each of these articles being replaced as it is withdrawn by a carbohydrate-free substitute. The final *strict* diet would be something as follows :—

Breakfast :—Bacon or buttered eggs, or both ; or some cold ham ; casoid-meal bread with plenty of butter ; coffee made with sugar-free milk and sweetened with saccharin.

About 11 a.m. :—A glass of sugar-free milk and a diabetic biscuit or rusk.

Luncheon :—Soup ; any animal food, *e.g.*, a little cold meat or game or some fish ; cheese ; salad with plenty of oil ; some starch-free bread ; as a beverage, any natural wine or a little spirit and aerated water.

Afternoon :—Tea with plenty of thick cream and a diabetic rusk or two, or biscuit, with plenty of butter.

Dinner :—Any clear soup with the addition of some grated

¹ My own practice in such cases is to give 6 ounces of cooked meat, 2 pints of sugar-free milk, 3 eggs, and 4 ounces of casoid-meal bread daily, which together contain about as much protein as 500 grammes of meat. If the sugar-excretion does not fall on this, or if the patient loses weight, or if coma threatens, I add a weighed quantity of ordinary bread.

cheese ; fish ; any meat ; green vegetables with melted butter ; baked custard made of sugar-free milk and eggs ; beverage as at luncheon.

At Bed-time :—A glass of sugar-free milk and a diabetic rusk or biscuit.

If such a diet suits the patient—and of course it admits of variation to meet individual tastes—and if the sugar-excretion disappears, he should adhere to it as long as possible. After a few weeks one may test his powers of consuming carbohydrates cautiously by allowing a weighed quantity of bread, and it will often be found that a certain degree of assimilative power has returned. In such a case one may allow a small quantity of bread (or its equivalent in some other starchy food) daily, the condition of the urine, however, being carefully watched. More commonly one finds that the failure of assimilative power is progressive, and that cases which begin in this group pass sooner or later into the other, in which even on strict diet some sugar is excreted, though by careful treatment such a result can often be postponed for a considerable time.

USE OF PARTICULAR ARTICLES OF DIET IN DIABETES.

Fatty Foods.—It might truly be said that the usefulness of any article of diet to a diabetic is in direct ratio to the amount of fat which it contains. For fat is the only nutritive constituent of food which cannot do a diabetic any harm : *it never increases the output of sugar*. It follows from this that a large part of one's duty to a diabetic patient consists in teaching him to eat as much fat as possible. The best forms of fatty food are bacon and butter (each of which contains about 80 per cent.), Devonshire cream (60 per cent.), and salad- or olive-oil (which are pure fat). Every diabetic should learn to consume at least a quarter of a pound of butter a day ; his bread should be soaked in it and it should be used as a sauce for green vegetables and fish. Cream may be taken in tea or coffee. If there is difficulty in digesting enough fat—and many diabetics experience such difficulty—the administration of a little alcohol at meals will often improve matters.

Animal Foods.—The diabetic has all the products of the animal kingdom to choose from except milk (*see above*).

Where a strict diet is being enforced, oysters and liver should also be avoided, as they contain some glycogen ; and sausages are never permissible unless one knows exactly how they are made. It will be understood from what has been said above that the richer any animal food is in fat, the better it is for these patients. For this reason cheese is very suitable.

Milk.—No absolute rule can be laid down regarding the use of milk by diabetics. To some it is undoubtedly harmful, increasing the glycosuria and thirst ; others again can take it without much harm. Experiment alone can decide in any given case. For those who are on a strict diet a sugar-free milk can be obtained,¹ which is a great help to nutrition. It is rich in fat and in all the other constituents of milk except sugar ; it is pleasant to take, and lends itself fairly well to the manipulations of the cook, *e.g.*, in the preparation of custards. It will be found of the very greatest service in all severe cases.

Bread and its Substitutes.—Perhaps the greatest of all difficulties in the feeding of a diabetic is to find a satisfactory substitute for bread. Thanks to the introduction of the casein preparations, great progress in this direction has been made in recent years, and breads can now be obtained which are absolutely free from starch, and which are also of quite a fair degree of palatability.² Gluten-bread, on the other hand, once so much used, is not only unpalatable and innutritious, but, in my experience at least, never really free from starch. Besides the casoid breads, the makers of diabetic foods have exhausted their ingenuity in the production of biscuits of various sorts, most of which are quite harmless ; and by ringing the changes on these, considerable variety can be introduced into the diet. Whilst on the subject of breads, it may be well to say a word about what I may call the "*Toast Fallacy.*" I scarcely ever see a diabetic—especially in private practice—who does not say to me : "Of course I never eat any bread—*only toast.*" How the idea ever got started that toast is less harmful to diabetics than ordinary bread, I do not know ; but there is no doubt that it is extremely widespread.

¹ Supplied by Clay, Paget, and Co., 71, Ebury Street, S.W.

² That which I always use myself is the casoid-meal bread of Messrs. Callard and Co., Regent Street.

Yet a moment's reflection will suffice to show how utterly erroneous it is. The only important change which bread undergoes when toasted is that it loses water, whilst some of its starch-granules are ruptured and others converted into dextrin. Weight for weight, therefore, toast is richer in carbohydrates than bread, and consequently more instead of less harmful to diabetics.

Potatoes.—There is probably too great a tendency to banish potatoes forthwith from the diet of anyone who has sugar in the urine. Now potatoes, after all, are not a *very* starchy food. They are much less so, for instance, than bread. The average amount of starch in the potato is about 20 per cent. ; that in bread is nearly 50 per cent. Weight for weight, then, the potato is much the less harmful of the two. It should be said, too, in its favour that it is an unrivalled carrier of fat, for it will sop up a large quantity of melted butter ; and for that reason it is often advisable to allow a diabetic who is not on a rigid diet a certain quantity of potato in lieu of some bread.

Vegetables and Fruits.—Roughly speaking, one may say that all green vegetables—that is, the parts which grow above ground—are harmless to diabetics, whilst the root and tubers should be avoided. It is true that even green vegetables contain a little starch, but the total quantity is negligible ; whilst, on the other hand, they are, like potatoes, admirable vehicles for fat.

Fresh fruits must be used with caution ; dried fruits never at all. I have known even the bottled fruits sold by the makers of diabetic foods, and specially prepared so as to get rid of as much of their sugar as possible, raise the excretion in the urine quite appreciably. Nuts, on the other hand, are a valuable food for diabetics, chiefly because of their richness in fat.

Lævulose, the sugar found largely in some fruits, is sometimes an aid in the diabetic dietary, for some patients seem to be able to assimilate it even although they dare not touch any other form of sugar. It is always an experiment in any given case, however, and its price makes its free use impossible.

Beverages.—The diabetic is a thirsty man, and beverages must always play a large part in his menu. There is no need to restrict his intake of fluids, but some attention must be paid to their quality. All those which contain sugar must, of course,

be eliminated. These include the sweetened aerated beverages (*e.g.*, lemonade *et hoc genus omne*), the sweeter wines, and all malt-liquors and liqueurs. On the other hand, spirits are harmless, for they contain mere traces of sugar.¹ Alcohol is undoubtedly a food for diabetics, and has the additional advantage of making it easier for them to digest fat. Some form of alcoholic beverage should, therefore, be taken daily. Tea and coffee are both admissible, and form admirable vehicles for cream ; and even cocoa may be allowed, provided the pure powder be used and not one diluted with starch.

DIET IN DIABETIC COMA.

If coma sets in or appears imminent, all attempts at a strict, and especially a highly nitrogenous diet, should be abandoned, for there seems to be little doubt that the production of the acid products which are the cause of the coma is facilitated by the ingestion of much proteid food. The best article of diet in such circumstances is skimmed milk, which may be given freely, either plain or mixed with Vichy water. It may also with advantage be made a vehicle for the administration of bicarbonate of soda. At the same time alcoholic stimulants should be freely used, for the combustion of alcohol in the tissues appears to lessen the destruction of proteids which are the source of the acid poisons that produce the coma.

DIET IN THE DIABETES OF ELDERLY PERSONS.

It has already been stated that no clear distinction can be drawn between the diabetes of young subjects and that of older persons. None the less is it true that, whereas in a typical case of the former the glycosuria is usually not only permanent, but *progressive*, in the latter it has not the same tendency continuously to increase. It is for this reason that absolute strictness of diet is less necessary when one is dealing with an elderly patient. In many such cases the glycosuria will be found to have lasted for several years with apparent impunity as far as the general health is concerned. If no complications are present, it is usually sufficient to stop the consumption of

¹ The sale of "diabetic whisky," for instance, is absurd; any whisky is suitable for a diabetic.

sugar altogether, and to restrict that of starchy foods. Many such patients, moreover, especially if there is a tendency to obesity, are greatly improved by an all-round reduction in the quantity of food consumed. Alcohol, too, must be ordered with much more caution in this form of the disease, for in some cases at least it would seem that the glycosuria has actually been caused by an excessive consumption of alcohol, especially in the form of beer. By attention to these rules the output of sugar can usually be stopped altogether or restrained within moderate bounds. Should complications develop, however, it is easy by more rigid dieting to suppress the excretion of sugar completely.



SARCOMATA OF THE ALIMENTARY CANAL; WITH THE REPORT OF A CASE.¹

By EDRED M. CORNER, M.B., B.S., F.R.C.S.,

*Assistant Surgeon to St. Thomas's Hospital and the Hospital for Sick Children,
Great Ormond Street; Erasmus Wilson Lecturer, R.C.S.; and*

H. A. T. FAIRBANK, M.B., M.S., F.R.C.S.,
Surgical Registrar, Charing Cross Hospital.

WE venture to bring before the Society the conclusions we have come to, as a result of a thorough examination of all, or nearly all, the published cases of primary sarcoma of the alimentary tract. Our attention was called to this subject by the occurrence of a case of sarcoma of the colon with intussusception, which case we record. The list includes all the cases of sarcoma affecting the canal from the oesophagus to the rectum ; sarcomata of the mouth, pharynx and anus have been omitted. Care was taken in collecting the cases to exclude all those in which any doubt existed as to the nature of the growth ; and also those in which there was any possibility of the growth in the bowel being secondary to a tumour elsewhere in the body. It has also been our intention to determine some of the points in which sarcomata of the alimentary tract differ from carcinomata of the corresponding regions. Our paper will naturally fall into the following sections : the case to be reported ; a *résumé* of the general features of these cases ; *résumés* of the characteristics of the sarcomata of the various regions ; their differences from carcinomata ; and finally, the literature. In this way we hope to add many features of ætiological and clinical interest to this little-known class of case.

The case is well worthy of record in itself, as only five examples of intussusception complicating sarcomata of the alimentary canal have been recorded previously, and our case is the only one in which that condition occurred in the colon ; and again, it was the eleventh case of sarcoma of the colon.

¹ A paper read before the Pathological Society of London.

CASE OF COLIC INTUSSUSCEPTION COMPLICATING A
SARCOMA OF THE ASCENDING COLON.

The following case was reported in brief as an interesting example of colic intussusception, in the *St. Thomas's Hospital Reports*, 1901.

A boy, W. H., aged 9 years, was admitted to St. Thomas's Hospital on September 5, 1901. He had been constipated for some time. One month previous to admission he began to have attacks of severe pain in the "stomach" which doubled him up ; these attacks lasted for about 10 minutes, and took place two or three times daily. A week before admission, for the first time, he passed "a good deal of bright blood" with his motions ; and this happened again shortly afterwards. On the day before his admission to the hospital he became much worse ; the pain was very bad, and did not pass away as usual. He vomited a good deal, passed blood and mucus *per rectum*, and looked very ill. An abdominal examination revealed a long sausage-shaped tumour in the left loin and iliac fossa. The right iliac fossa felt "empty." *Per rectum*, a mass could be felt, round which the finger could be swept, but no aperture could be felt in it. The tongue was coated with a thin layer of black fur. The urine contained a trace of albumen. The temperature was 97·6, the pulse 122, the respirations 30. Abdominal section was immediately proceeded with.

Operation.—The abdomen was opened in the middle line below the umbilicus. The intussusception passed so far down the rectum that the apex could not be felt. By gliding the sheath in a downward direction the point was easily brought to the touch. The invagination was easily reduced, and found to have started in the middle of the ascending colon, at which point a rounded tumour about 1½ inches in diameter could be felt within the bowel. The bowel was incised and a sessile neoplasm exposed. The mass was thought to be adenomatous, and was cut away with scissors. The mucous membrane was sutured with fine silk ; the incision in the bowel being closed in a similar way, and also that in the abdominal wall. The after-history was uneventful, the stitches being removed on the seventh day : the wound being healed by first intention.

In his pathological report, Mr. Shattock described the tumour as "a round-celled growth," either "lymphatic or

sarcoma." When the boy was discharged from the hospital there was nothing to be felt by palpation of his abdomen.

In nine weeks' time after the operation he was readmitted to the hospital with a tumour, as large as an orange and freely moveable, under the right rectus abdominis. There was no trouble with the bowels.

On December 14, the abdomen was again opened through the right rectus, and the tumour delivered. It was found to consist of a mass, the size of an orange, with omentum adherent to its anterior surface, and the ascending colon on the outer side. Two enlarged glands were felt near the vertebral column. The "recurrence" had taken place rather in the retro-peritoneal tissue than in the bowel. The mass, the involved portion of the ascending colon, and the infected glands were freely excised. The two ends of the bowel were joined together by two rows of silk sutures (circular enterorrhaphy), and the abdominal wall closed *secundum artem*.

Death followed the operation in 30 hours, the boy never recovering from the shock. At the post-mortem examination, made by Dr. Colman, every organ was healthy ; there were no signs of peritonitis or sepsis. The serous cavities contained some fluid, the result of an infusion. The cause of death was shock.

Microscopical examinations made by Mr. Shattock showed that the tumour was a round-celled sarcoma.

The growth had originated in the sub-mucous tissue of the ascending colon, and had developed as a sessile tumour inwards towards the lumen of the bowel. This portion of the neoplasm was removed. Within nine weeks of the "removal" a tumour the size of an orange had appeared on the inner side of the site of the old tumour ; and further, the nearest lymphatic glands had been affected. The recurrent tumour and the part of the colon excised are shown to the Society. Towards the lumen of the bowel the tumour is ulcerated, the ulcer communicating with a cavity lined by more or less broken-down growth in the interior of the tumour.

GENERAL REMARKS ON PRIMARY SARCOMATA OF THE ALIMENTARY TRACT.

We have collected 175 cases, all of which we believe to be true cases of primary sarcoma of the alimentary tract. Besides

these, there are records of some 20 others which we were unable to consult. The cases have been divided up into six groups, according to the portion of bowel affected.

A few remarks will now be made on the occurrence, situation, &c. of sarcomata of the alimentary tract in general; and later, reference in detail will be made to sarcomata of the different portions of the canal.

Sex.—Males are more commonly affected than females, in the proportion of nearly 2 to 1, when all the cases are taken together. The stomach and large intestine are exceptions to this rule; in these portions of the gut the disease occurs with about the same frequency in the two sexes. In the oesophagus the proportion of males to females is as 5 to 1, and in the rectum 4 to 1. Carcinoma affects the intestinal tract of the sexes equally frequently (Ball).

Age.—Sarcoma may occur in any part of the alimentary canal at any age. In the oesophageal and rectal cases sarcoma, like carcinoma, occurs most commonly between the ages of 50 and 70. The stomach is affected most frequently between 40 and 50, and the small intestine between 30 and 40. Of the ileo-cæcal and colonic cases a large proportion occurs during the first decade of life. Chart I. is designed to show the age at which sarcoma of the various parts most commonly occurs.

Chart I.—The dotted line indicates the age-incidence of the greatest frequency of sarcoma in the various regions specified.

The curve does not indicate accurately the frequency of disease at any particular age, but denotes roughly the periods of life at which the various parts of the gut are most commonly affected.

Situation.—About 70 per cent. of the cases occurred in the stomach and small intestine. The body of the stomach and the ileum are most commonly the seat of the disease, and appear to be affected with equal frequency. The oesophagus is rather more frequently the seat of sarcoma than is the rectum. The vermiform appendix is very rarely the seat of primary sarcoma. Chart II. shows the relative frequency of the disease in the various portions of the bowel.

The pylorus, the colon, and the rectum appear to be the most common places for a carcinomatous growth. Sarcoma

does not seem to show the same predilection for points of friction or irritation as carcinoma does. Although sarcoma, when affecting the oesophagus, occurs usually in the lower third, it is not the cardiac orifice which is the seat of the

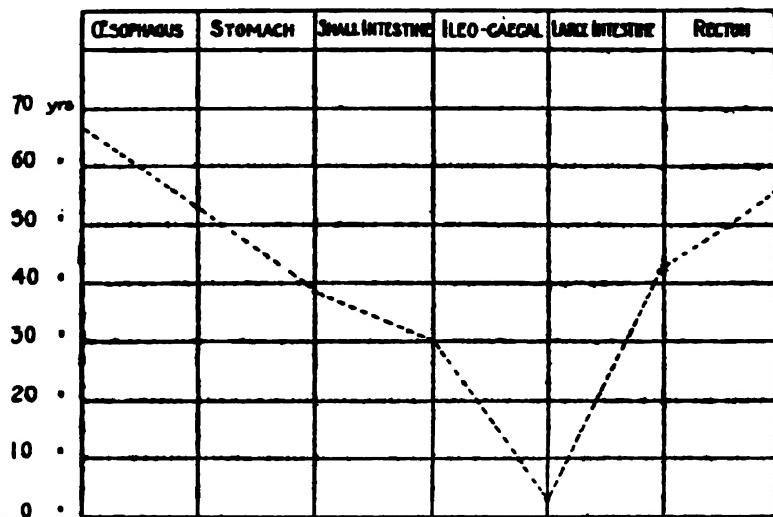


Chart I.—*Chart showing commonest age for Sarcoma of various parts.*

disease, but a point an inch or two higher up ; in this respect it differs from carcinoma. Again, the body of the stomach is more commonly affected than the pylorus. Sarcomata differ from carcinoma, in occurring far more frequently in the small intestine than in the large.

TABLE OF REGIONAL DISTRIBUTION OF ALIMENTARY SARCOMA.

Oesophagus	-	-	-	-	-	14
Stomach	-	-	-	-	-	58
Small intestines	-	-	-	-	-	65
Ileo-caecal region	-	-	-	-	-	20
Large intestine	-	-	-	-	-	11
Rectum	-	-	-	-	-	7
						<u>175</u>

Chart II.—The curve indicates the relative frequency of occurrence of sarcomata in the various regions,

Symptoms.—Definite intestinal obstruction occurs in at least 25 per cent. of the cases, but, owing to the brevity of many of the records, this figure is probably too low. Wasting and anaemia, the latter often of a severe type, are usually present.

Pain, of varying degrees of severity, occurs in the majority of cases. The symptoms presented by the disease in the various portions of the bowel will be detailed later. Vomiting occurs more frequently than the number of cases of obstruction would indicate; this symptom was recorded in at least 51 of the cases. Irregular fever occurred in 25 cases; it does not seem to depend in every case on the presence of ulceration of the tumour, though such is often found *post-mortem*. Excluding the cases of intussusception, haemorrhage *per rectum* occurred only 9 times. In this sarcomata differ very greatly from carcinomata.

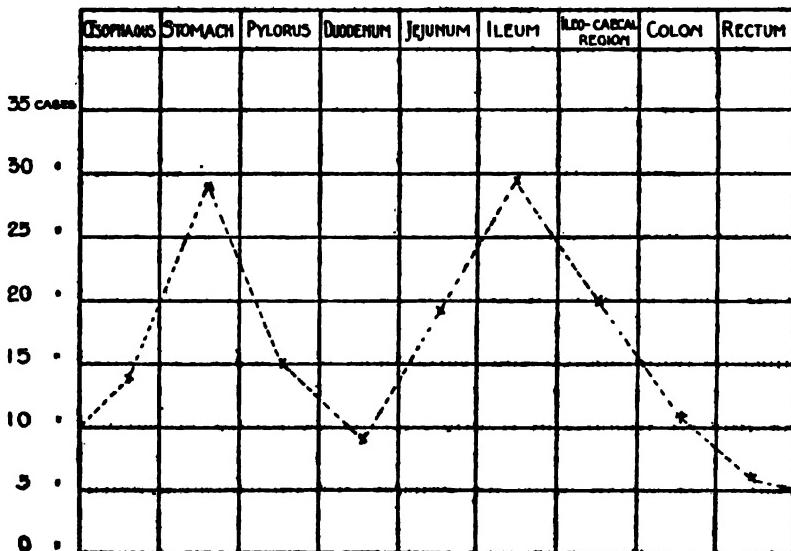


Chart II.—Table showing roughly the frequency of occurrence of Sarcoma in the various parts.

In the cases affecting the abdominal portion of the tube, i.e., excluding the oesophagus and rectum, we find that a palpable tumour was found in 56 out of 152 cases; i.e., in over one-third of the total number; many of the tumours were

of large size. The blood was examined in too few cases to make the presence or absence of leucocytosis of any diagnostic value. The average duration of life in these cases is about six months.

The following features serve to distinguish cases of sarcoma from those of carcinoma :—

1. The age of the patient.
2. The more rapid course of the disease in sarcoma.
3. The presence of a tumour of considerable dimensions.
4. The early occurrence, and the severity of anaemia and wasting.
5. The almost constant presence of pain, often severe.
6. The absence of haemorrhage.
7. The presence of irregular fever.

MORBID ANATOMY AND PATHOLOGY.

The growth may be annular, or may grow as a plaque or polypoid mass projecting into the lumen of the bowel ; or the two conditions may be combined.

Excluding the gastric and ileo-caecal cases, 25 were annular and 19 pedunculated ; in the rest the exact condition is not recorded accurately. It has often been stated that sarcoma tends to produce dilatation of the lumen rather than stenosis. This may be true if stenosis is taken to mean an actual shortening of the internal circumference of the tube ; but it must be remembered that sarcomata may cause obstruction by the size of the polypoid masses, although the bowel-wall may be dilated round the tumour. This condition is particularly well seen in the oesophagus and rectum. It is also probable that obstruction will be caused by interference with the peristalsis of the gut on account of the infiltration of the muscular wall of the bowel by the growth, although the lumen may even be somewhat dilated.

Dilatation, on the other hand, may occur around a polypoid mass, as a result of the breaking-down of masses of growth, or as a true dilatation, the internal circumference of the lumen being increased as the wall becomes infiltrated. Dilatation was recorded in 13 cases, and obstruction from other causes in 44 cases.

The subserous variety, usually found in the stomach, form large pedunculated tumours.

Intussusception occurred six times : three times in the small intestine, twice in the ileo-cæcal region, once in the colon (the case now recorded). Prolapse of the tumour is also commonly seen in the rectum. The growth usually begins in the submucous tissue, although it may begin in the muscular layer or in the subserous tissue.

Glandular involvement was found in as many as one-third of the cases, and this, although many of the reports are without full details. With regard to metastases, the lungs seem to be remarkably rarely affected ; only in nine cases did secondary growths appear in these organs. The liver and the kidneys are most often found affected with secondary growths ; such are often seen in the mesenteries, probably in lymphatic spaces there.

All varieties of sarcoma are found in the alimentary tract. The round-celled sarcoma is by far the most common type ;

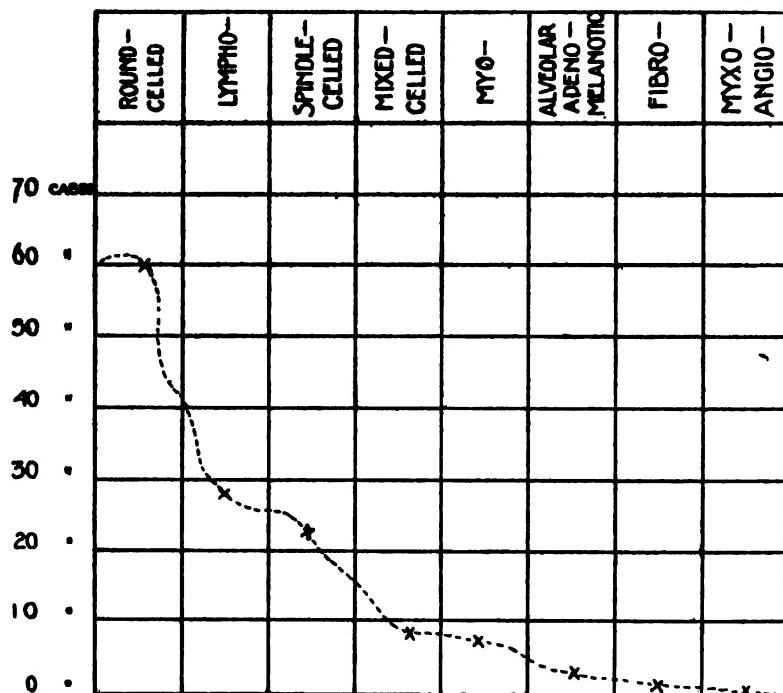


Chart III.—*Chart showing relative frequency of various species of Sarcoma.*

it occurs in about a third of the cases. The lympho-sarcoma and spindle-celled growth come next in order of frequency. We found three melanotic cases, two in the rectum and one in the ileum. The last was reported by Sir F. Treves.

Chart III. shows the relative frequency with which the several varieties of sarcoma have been found. In one case, so competent a pathologist as Mr. Shattock was unable to decide from the original microscopic specimens as to the nature of the growth, that is to say, whether it was lymphoid tissue or round-celled sarcoma. There has been naturally much confusion in the literature between lympho-sarcoma and round-celled sarcoma.

There are one or two points to which we will now draw attention, as they are of interest in considering the aetiology of these tumours. The significance of them we will not venture to estimate, but we think that they may be worth recording.

1. Five of the cases of sarcoma of the stomach (58) suffered from gastric symptoms for some years before the onset of severe symptoms. In one case it is hinted that the growth commenced in the scar caused by a bullet-wound received some years previously.

2. Two of the cases affecting the ileo-cæcal (19) region, not the appendix, had attacks resembling appendicitis for some years previously. In one appendicular case a faecal concretion was present.

3. In three of the seven rectal cases the patients had suffered from haemorrhoids for some years.

These facts seem to suggest that, as irritation, in its widest sense, is a cause of carcinoma, so may irritation in the connective tissue be an initial or local factor in the production of sarcoma. Irritation of epithelium leads either to its death or to cell-division; irritation of connective tissue produces similar results *plus* the occurrence of inflammation. In this way young connective tissue is formed, and may be the birth-focus of a sarcoma.

OPERATIONS.

In all, excision of the growth, with or without resection of the gut, was performed 51 times; 34 patients, i.e. two-thirds,

recovered from the operation. Of these, six are reported as being free from recurrence after periods extending one to nine years after operation. Twelve others are reported as being well from three to eight months after operation.

SARCOMA OF OESOPHAGUS.

Number of cases collected, 14.

Sex.—More common in males : male, 11 cases ; female, 2 cases.

Age.—Most common at same age as carcinoma is, though it may be found at any age. The youngest example was found at 4 years, the oldest at 70 years.

The following table shows the ages of cases :—

From 0 to 10 years	-	-	-	I case.
„ 10 „ 20 „	-	-	-	0 „
„ 20 „ 30 „	-	-	-	1 „
„ 30 „ 40 „	-	-	-	2 cases.
„ 40 „ 50 „	-	-	-	3 „
„ 50 „ 70 „	-	-	-	6 „

Situation.—The most common situation is the lower third of the oesophagus. Of 8 cases in which the exact situation is stated, in 5 the lower third was the seat of the growth, in 2 the middle, and in 1 the upper part. Sarcoma differs from carcinoma in not occurring at the cardiac orifice, but a little above this point.

Symptoms.—The symptoms closely resemble those of carcinoma. Gradually-increasing dysphagia is almost invariably present. In one case, a patient who died of pneumonia, the growth was discovered *post mortem*, no symptoms of oesophageal trouble having been noticed during life.

Sarcoma differs from carcinoma in running a more rapid course, with great emaciation. Starck says that in sarcoma the pain is much worse, and occurs earlier than in carcinoma. The pain is situated between the shoulders, and is of a severe, stabbing character. It is worse on fasting, especially at night ; whereas the pain in carcinoma is worse on eating.

The average duration was six months.

Morbid Anatomy and Pathology.—The growth commences in the submucous tissue, and usually completely surrounds the oesophagus. In three cases the growth was pedunculated,

and formed a long mass, moulded to the shape of the somewhat dilated cesophagus. Ulceration with perforation, and the formation of gangrenous abscess cavities in the mediastina, lungs, and surrounding tissues, is frequent. Almost every variety of sarcoma has been found. In the recorded cases we find :—Round-celled, 2 ; spindle-celled, 3 ; mixed-celled, 1 ; lympho-sarcoma, 1 ; myo-sarcoma, 1 ; alveolar, 2.

Secondary growth were found in 50 per cent. of cases.

In the 14 cases we find secondary growths occurring in the glands in 7 cases ; in the liver, 2 ; in the bones, 2 ; in the bowel, 4 ; in the lungs, 3 ; in the kidneys, 3 ; in the tongue, brain, adrenal, and spleen, 1 each.

Operation.—Gastrostomy was performed in one case ; the patient died seven days later from peritonitis and pneumonia. The others were treated medicinally.

SARCOMA OF THE STOMACH.

Number of cases collected, 58.

Sex.—The sexes are equally liable to this disease : males, 26 ; females, 29.

Age.—Affects all ages ; between 40 and 50 is the most common period. The oldest case was 78 years of age ; the youngest 3½. The following table shows the ages of examples reported :—

From	0 to 10 years	-	-	-	-	2 cases.
"	10 „ 20 „	-	-	-	-	8 „
"	20 „ 30 „	-	-	-	-	5 „
"	30 „ 40 „	-	-	-	-	6 „
"	40 „ 50 „	-	-	-	-	15 „
"	50 „ 60 „	-	-	-	-	8 „
"	60 „ 70 „	-	-	-	-	5 „
"	70 „ 80 „	-	-	-	-	3 „

Situation.—The pylorus is less commonly affected than the body of the stomach. In carcinoma, the pylorus is the seat of the growth in about 60 per cent. of the cases ; in sarcoma the corresponding percentage is about 36. Of the instances in which accurate descriptions of the growth were given, we found the pylorus affected in 15 cases ; the greater curvature in 6 ; the lesser curvature in 5 ; the posterior wall in 10 ; the

anterior wall in 1; the growth was diffuse over the whole stomach in 6.

Symptoms.—Definite obstruction and gastric dilatation occurred in only four of the pyloric cases. Dilatation of the stomach without pyloric disease was recorded in 2. The symptoms most commonly noted were pain, vomiting and wasting. Haematemesis only occurred in 3 cases; a point which helps to distinguish these cases from carcinoma. A palpable tumour (in several cases of enormous size) was found in 22 cases, and possibly occurred in others in which the notes are short and imperfect. Irregular pyrexia was noted in 4 instances. Leucocytosis was found in 5 cases, and was stated to be absent in 6 others in which the blood was examined. Leucocytosis does not seem to depend on ulceration or sloughing of the growth, and does not appear to be of any diagnostic value. Anæmia is a noticeable feature, and occurs early in the course of the disease. In 4 cases the anæmia was stated to be extreme, and in 1 the diagnosis of "pernicious anæmia" was made.

Jaundice was present in 4 cases, ascites in 11, oedema of the legs in 5. One case was diagnosed as a left movable kidney, another as an ovarian cyst; the first was a pedunculated subserous growth, and the second was a myo-sarcoma undergoing cystic degeneration, and was, presumably, of large size.

Dr. Soltau Fenwick says: "A large omental tumour and a large nodular liver" are much more in favour of carcinoma than sarcoma. He also draws attention to the occurrence of congestion and hyperplasia of the spleen (15 per cent. of cases), and of nodules in the skin about the umbilicus, both of which he considers of value in cases of sarcoma.

Several examples had a history of dyspepsia of two, three, or even 20 years' standing. One case had a history of an old bullet-wound of the stomach.

The following points might help in the diagnosis from carcinoma:—The rapid course with marked anæmia, the absence of haematemesis or gastric dilatation, the presence of a large tumour, and, possibly, the age of the patient.

Morbid Anatomy and Pathology.—The growth most com-

monly is submucous, the mucous membrane remaining intact for a considerable time. The growth may commence in the muscular or in the subserous tissue ; in the latter case it forms a pedunculated tumour outside the stomach. A number of very large examples of these tumours have been reported. The mass may project into the cavity of the stomach and ulcerate, or it may spread widely in the stomach-wall and cause little or no ulceration. It may surround the pylorus and cause obstruction, or may form a constriction near the centre of the stomach (hour-glass stomach). The large tumours, especially of the subserous variety, are liable to undergo cystic degeneration. In one the large cavity thus formed was opened at the operation.

The average duration of symptoms before death in the cases not operated upon was about nine months. Dock states that in 9 cases he found free hydrochloric acid absent from the gastric juice, and that in most of these lactic acid was present. The same observer states that anaemia and leucocytosis are usually present.

All varieties of sarcoma have been found. We found, round-celled, 21 cases ; spindle-celled, 7 ; lympho-sarcoma, 8 ; mixed-celled, 4 ; myo-sarcoma, 6 ; fibro-sarcoma, and alveolar, 2 each ; and myxo- and angio-sarcoma, 1 each.

Secondary growths may occur in at least 40 per cent. of cases, and probably in more. The glands in the neighbourhood of the stomach are commonly affected ; the liver, the kidneys, other portions of bowel and the omentum are the other situations in which secondary growths are commonly found, in the order of their frequency.

Operation.—Excision of the growth was performed in 15 cases, 12 of which recovered from the operation ; 4 are reported as being alive and well after 4, 5, 12, and 24 months, respectively, since operation.

One case died of recurrence after eight months. The average duration of symptoms before operation in 6 successful excisions was 10 months. Gastro-enterostomy was performed in 1 case, which died of shock. Three cases were subjected to exploratory laparotomy, and in 1 of these a large cavity in the growth was opened.

SARCOMA OF SMALL INTESTINE.

Number of cases collected, 65.

Sex.—The proportion of males to females is about 3 to 1; males 44, females 16 (5 not stated).

Age.—It occurs earlier in life than carcinoma, though the disease has been found at almost any age. More than half the cases were between 20 and 40 years of age. The oldest was 70; the youngest was "new born." We found:—

From 0 to 10 years	-	-	-	7 cases.
" 10 , 20 "	-	-	-	7 "
" 20 , 30 "	-	-	-	16 "
" 30 , 40 "	-	-	-	19 "
" 40 , 50 "	-	-	-	10 "
" 50 , 70 "	-	-	-	4 "

Situation.—The liability to sarcoma increases as one passes downwards, the ileum being by far the most common seat of the growth. We found the duodenum affected in 8 cases, the jejunum in 19, and the ileum in 28. In 9 the exact seat was not stated.

Symptoms.—The usual symptoms are pain, wasting, anaemia, vomiting, with constipation or diarrhoea. Vomiting is stated to have occurred in only 15 cases, but it was probably present in many more. Constipation, apart from definite obstruction, was present in 8; diarrhoea was recorded in 10; and the passage of pus and blood per rectum in 2, in neither of which was there an intussusception. A tumour was felt in the abdomen in 18 cases. Definite obstruction, recognised clinically, occurred in 12 cases, and in some of these the symptoms were acute, without any previous signs of chronic obstruction. Intussusception was found in 3 cases, all of which died without operation. Irregular fever occurred in 10 cases, and was stated to be absent in 5. Leucocytosis was found in 5 cases, in all of which either ulceration of the bowel, or peritonitis was present.

The diagnosis would seem to be extremely difficult, the only point which might assist in differentiating a case of sarcoma from one of carcinoma would be the age of the patient. Diagnosis from other diseases, such as tubercular peritonitis and chronic intussusception, prior to operation, must usually be impossible.

The average duration of symptoms in cases not operated upon was about 5 months.

Morbid Anatomy and Pathology.—The growth varies from a single polypoid mass to an extensive tubular infiltration of the wall of the bowel with several plaques in the bowel above and below the main mass. Obstruction, apart from the intussusception, may be caused in two ways:—First, by definite narrowing or constriction of the tube—this was noted *post mortem* in 4 cases. Secondly, by the formation of large masses projecting into the bowel, the bowel itself being really dilated. This occurred in 8 cases, at least, making up the 12 in which definite symptoms of obstruction occurred.

Dilatation of the tube was noted *post mortem* in 9 cases. This may occur as an actual dilatation of the tube, as the wall becomes more or less uniformly infiltrated; or may result from the ulceration and sloughing of large polypoid masses which had projected into the lumen of the bowel.

The growth usually commences in the submucous tissue, and is most commonly of the round-celled variety. A unique case of melanotic sarcoma is reported by Sir Frederick Treves. We found the round-celled variety 21 times, lympho-sarcoma 14 times, spindle-celled sarcoma 7 times, myosarcoma twice, and melanotic once.

Secondary growths were found in about 30 per cent. of cases. Involvement of the nearest glands took place in nearly half the cases. Masses of growth in the mesentery, apart from glands, are commonly found. The liver, kidneys, and other parts of the bowel are the most frequent situations for metastases.

Operation.—Resection was performed in 18 cases, of which 11 recovered from the operation. Of these 11, 2 were alive and well one year later; one was alive and well eight years later; 3 died of recurrence or metastasis after 3, 7, and 8 weeks respectively.

Exploratory laparotomy was performed in 6 cases, in one of which enterostomy was performed.

SARCOMA OF THE ILEO-CÆCAL REGION.

Number of cases collected, 20.

Sex.—Males seem more liable to the disease than females—males 12 cases, females 8.

Age.—In two-thirds of the cases, the patients were under 30 years, *i.e.*, much earlier than carcinoma. The oldest was 66; the youngest 2. We found :—

From 0 to 10 years -	-	-	-	7 cases.
" 10 " 20 "	-	-	-	1 case.
" 20 " 30 "	-	-	-	5 cases.
" 30 " 40 "	-	-	-	2 "
" 40 " 50 "	-	-	-	1 case.
" 50 " 70 "	-	-	-	3 cases.

Situation.—The cæcum was affected in 7 cases, the ileo-cæcal valve in 1, and the appendix in 4. A fifth case of primary sarcoma of the appendix is reported by Glazebrook, but we were unable to consult the report of the case. In the remaining 7 cases the exact origin of the growth was doubtful.

Symptoms.—The symptoms are often similar to those of appendicitis—either of acute, or recurrent sub-acute appendicitis—for which the disease has usually been mistaken. Pain, vomiting, constipation, and the formation of a tumour in the right iliac region, are the usual points of the case. Definite intestinal obstruction occurred in four cases, in two of which an intussusception was present. A palpable tumour was present in 11 cases, being movable in 3, and fixed in the rest. In one, the diagnosis of movable left kidney was suggested. Fever was present in 9 cases. In 2 there was a history of appendix-trouble of long standing.

The duration of symptoms in 6 cases, in which incision was not performed, averaged 5 months.

Morbid Anatomy and Pathology.—We have little information on this subject. Coils of bowel have been found matted around the cæcum, as in appendicitis. In one case an annular growth at the ileo-cæcal valve, more marked on one side, was associated with a partial intussusception of ileum into colon: a little above the valve was a secondary nodule in the mesentery and attached to the ileum. It would seem that this mass passed through the valve with the attached ileum, but the account is not quite clear. In two cases a cavity had formed communicating with one or two coils of bowel. Both cavities were opened as appendix-abscesses, and drained. In one case the appendix, which was the seat of the primary growth, was greatly dilated. In another appendix case there was present

a faecal concretion. In yet another the appendix was the seat of the disease, and the wall of the caecum was infiltrated for $\frac{1}{2}$ inch round the orifice of the appendix.

Round-celled growth is again the commonest ; it was found in 9 cases. In 4 the growth was a lympho-sarcoma, and the spindle-celled, mixed-celled, and "adeno" varieties were each found once.

The mesenteric glands were diseased in at least 5 cases, and the retro-peritoneal, or cervical glands in 3.

Metastases were found in the lungs, spleen, liver (2), kidney and stomach.

Confusion has arisen in one or two cases where granulation-tissue has been mistakenly supposed to be sarcomatous.

Operation.—Resection of the growth and bowel was performed in 11 cases, with 7 recoveries. The duration of symptoms before operation averaged five months. All the successful cases of resection are reported as being alive and well for periods varying from 3 to 8 months after operation.

In 5 cases exploratory laparotomy was performed, in 2 of which gangrenous abscess cavities were opened and drained.

SARCOMA OF LARGE INTESTINE.

Number of cases collected, 11.

Sex.—Males and females seem to be equally liable to the disease in this region—males, 3 ; females, 4. (4 not stated.)

Age.—Of 6 cases in which the age was stated, 3 occurred in children under 10, and one in each of the three succeeding decades. The oldest was 38, the youngest 4 years.

Situation.—The growth may affect any portion of the gut. The ascending colon was affected in 3 cases, the transverse in 1, the splenic flexure in 2, the descending colon in 1, and the sigmoid in 2.

Symptoms.—The symptoms appear to be those of chronic obstruction, even though definite constriction be absent. In 5 cases, intestinal obstruction supervened ; one being the case, now reported, in which an intussusception was present. In one other case there was entire absence of symptoms until the onset of acute obstruction. A tumour was felt in 6 cases ; in one the mass measured $19\frac{1}{2}$ inches in circumference.

Pyrexia occurred in 2 cases.

Morbid Anatomy and Pathology.—Polypoid or discoid masses and annular growths occurred in an equal number of cases. Dilatation of the lumen of the bowel was noticed in 2 cases, in one of which there was an "aneurysmal" dilatation of the bowel capable of holding a pint of fluid. In 2 cases obstruction was due to stenosis of the bowel.

The round-celled is again the most common variety, and was found in 7 cases. In 2 the growth was spindle-celled, in one mixed-celled. Metastases were found in 6 cases. In one instance the whole abdomen was involved by secondary nodules. Glandular infiltration was noted in 3. The lungs (four times), the ovaries (twice), the spleen (twice), and the kidneys, liver, pancreas, bowel, and brain (each once) were the seats of the metastases.

Operation.—Excision was performed in 2 cases. Both died of shock.

SARCOMA OF THE RECTUM.

Number of cases collected, 7. (The notes of 4 other cases could not be consulted.)

Sex.—Males would seem to be more commonly affected : males, 4 cases ; females, 1 case.

Age.—The ages of only 5 cases could be obtained, and were found to lie between 43 and 63, at which time carcinoma is most commonly found.

Situation.—Those occurring at the anus have been excluded. All the rest were within reach of the examining finger.

Symptoms.—The symptoms usually commence with constipation and pain in the rectum, the latter being increased by defæcation. Some haemorrhage may take place after the passage of a motion. In some instances, such symptoms as the above, associated with haemorrhoids, had existed for periods varying from 1 to 20 years. Later, a mass prolapses whenever the bowels are opened. At first it is reducible, but after may remain permanently outside the sphincters, subsequently increasing greatly in size. In one case the mass, which 12 months before had been the size of a walnut, at the time of the operation, had increased to the size of a foetal head. The tumour was excised, and recovery followed. Intestinal obstruction without any prolapse occurred in 2 cases, prolapse alone in 5. Distinct wasting and pruritus ani were each noted

once. The occurrence of diarrhoea, so often seen in carcinoma, was not recorded.

Morbid Anatomy and Pathology.—The growth was polypoid in 6 cases : in one, figured in Treve's *System of Surgery*, there was an annular growth extending for 5 inches. The submucous tissue is the seat of the growth. In one case cystic degeneration was found. The tumour was of the spindle-celled variety in 3 cases, lympho-sarcomatous in 1, melanotic in 2, alveolar in 1. In one of the melanotic cases 3 separate polypi were found, 2 of which were pigmented. In the other case the veins were found invaded, and the blood contained pigmented cells larger than leucocytes. In one (spindle-celled) case there was a secondary nodule in the skin of the thigh. It would seem that involvement of glands and the formation of secondary growths were less common than is the case in carcinoma of the rectum.

It must be remembered that it is impossible to estimate the duration of the growth.

Operation.—Excision of the mass was performed in 5 cases, with 3 recoveries ; 2 died of peritonitis. One case (melanotic with 3 separate masses) was alive and well 9 years later (Ball).

NOTE.—For list of references see the *Transactions of the Pathological Society*.



LEUCOCYTE-COUNTS IN EIGHTY-THREE
CASES OF APPENDICITIS. THE LIMITATIONS
OF LEUCOCYTOSIS AS AN INDICATION
FOR LAPAROTOMY.

By HERBERT FRENCH, M.A., M.D. (OXON.), M.R.C.P. (LOND.).

*Medical Registrar, Guy's Hospital; Gillson Scholar, Society of Apothecaries of London;
Radcliffe Travelling Fellow, Oxford University.*

INTRODUCTION.

FROM the surgical point of view, cases of appendicitis resolve themselves into three groups; namely, those which require no operative measures during the acute stage; those which need evacuation of pus from a local abscess; and those which require an immediate laparotomy for general peritonitis. In deciding whether a patient may be safely left for a time without operation, every symptom and sign needs careful attention:—the distribution of the pain, whether local or general; the vomiting; the extent of the hyperæsthesia; the presence or absence of a swelling; the mobility or the rigidity of the abdominal wall; the distension of the bowel, or the reverse; the facies of the patient; the condition of the tongue, whether moist or dry; the character of the respirations; the temperature; and the pulse-rate.

Even, however, when all the above points have been considered, it is sometimes impossible to decide whether or not pus be present. The case may seem at first fit to leave; yet shortly afterwards a sudden increase in the pulse-rate, more general tenderness, and rigidity, with absence of abdominal respiratory movements, may indicate the rupture of an abscess into the general peritoneal cavity. The physician regrets that he had not some further clue, helping him to recognise the presence of pus earlier. On the other hand, most surgeons prefer to leave an acute simple case until the inflammation has subsided, and then to remove the appendix during convalescence.

GENERAL RESULTS.

It is as such a further clue in recognising the presence of pus that leucocyte-counts have been found serviceable. There are numerous papers upon the subject, the more interesting of which are mentioned at the end of this article ; but in many published cases the authors attribute too great an importance to leucocytosis as a sign for operation. A new discovery is apt to attract too much attention to itself, with the result that too much is expected of it. The best way to correct this is to record the findings in a considerable number of cases ; and the present paper is a contribution to such record, from eighty-three consecutive cases at Guy's Hospital. It is remarkable what great variability they show.

LIMITATIONS TO THE VALUE OF THE SIGN.

Before discussing the cases themselves, it cannot be too strongly pointed out that a given degree of leucocytosis in appendicitis is not by itself a definite proof of either the presence or the absence of pus. Leucocytosis is not a "penny-in-the-slot" sign. A leucocytosis of 25,000 or more may occur in a patient who recovers completely without operation ; pus may need evacuation in a patient whose leucocytes never exceed 15,000. The leucocytosis must be taken into account along with all the other clinical indications. The pulse-rate by itself will not decide whether pus is to be let out or not ; neither will the leucocytosis ; but just as the pulse-rate is of very great assistance in deciding when an operation should be performed in some cases, so may the leucocytosis be of similar assistance in others. It is only one amongst many valuable clinical signs in such conditions, but cannot be regarded as of more importance than the others.

Many cases of appendicitis are clinically such that whatever the leucocyte-count might show, the other signs would indicate the need for operation. Others, on the other hand, are such that the pulse-rate, the temperature, and the abdominal and general conditions leave it still uncertain whether operation should be performed or not. It is in these that the leucocyte-count may decide one way or the other.

Earlier observers held that the absolute leucocytosis was all-important. For instance, Wasserman⁹ and Da Costa⁵ both conclude that pus is always present when the leucocytes exceed 20,000. This is apparently not true; or at least the patient may frequently recover without operation even when the leucocytes exceed 30,000 (Cases 21, 43, 44). Gazin and Gros² lay much more stress upon a "rising" leucocyte-count, and give the following examples:—

	Without Pus.			With Pus.	
Leucocytes	-	-	25,800	...	8,350
"	-	-	26,600	...	10,200
"	-	-	24,000	...	26,250
"	-	-	16,400	...	29,000
"	-	-	8,000	...	34,000
"	-	-	—	...	39,000

A rising leucocyte-count with accumulation of pus is well exemplified by Case 66, and several others also show it; whereas none of those patients in whom no pus was found showed a similar continued rise. Yet it cannot be laid down as an infallible rule "that pus is indicated by a rising leucocytosis"; for pus may be present with a falling count as in Case 60; or with one which remains almost stationary, as in Case 73. A good example of a falling count indicating resolution, though the symptoms were for a time grave, is seen in Case 81. One can only say that a rising leucocytosis is probably a sign of pus, and that it seems to have a greater diagnostic value than has the mere magnitude of the total count.

FOUR CLINICAL GROUPS AND THE LEUCOCYTE-CHANGES IN EACH.

With a view to laying still greater stress upon the great variability in leucocytosis in appendicular conditions which appear otherwise similar, the present 83 cases have been classed into the four following groups:—

Group I.—In these patients the onset was variable, sometimes sudden, sometimes gradual; vomiting usually occurred during the first twenty-four hours, but seldom after; there was constipation, as a rule; the signs were all localised to the right

iliac fossa, with pain, hyperæsthesia, and often rigidity, but without tumour. They all became convalescent without operation.

In three of these (Cases 11, 15, and 19) an operation performed after convalescence showed adhesions round the appendix, without pus. In the remainder no operation was performed, and therefore no absolute proof that pus was absent can be adduced. The patients became apparently quite well, and no operation was needed. In most of them there was little or no leucocytosis. In more than two-thirds, the leucocytes did not exceed 15,000, and this is what one might expect. But in one-seventh the leucocytes exceeded 20,000, in one even reaching 31,000, without any other clinical evidence of pus. This is contrary to expectation, but is an important point; showing, as it does, that the total leucocyte-count must be very high before it by itself can be regarded as an absolute indication for operation.

Group II.—In these cases the clinical signs were again local, and similar to those of Group I., but with this difference:—a definite tumour could be felt in all of them. In many of these the question of operation was frequently discussed, but in all there was spontaneous resolution of the lump.

In this group again it is not possible to say absolutely that no pus was present. In Cases 31 and 32 an operation was performed after convalescence, and adhesions round the appendix, without pus, were found. In the remainder no operation was performed. In some there may have been an abscess which ruptured into the bowel; but as far as possible those cases in which a rapid subsidence of the tumour occurred, suggestive of rupture of an abscess into the colon, have been excluded from this group and included in the next. It is possible that appendicular pus may be spontaneously absorbed, as is known to be the case occasionally with empyemata; and this may have happened in some of these cases. But the point is that spontaneous resolution of the tumour, without clinical evidence of the presence of pus, occurred in all, and in none was there need for an operation during the acute stage.

In these cases also there are the greatest variations in the

leucocytes. The maximum (31,000) and the minimum (8,300) are almost identical with those in the first group. In more than one-third the leucocytes exceeded 20,000, in one case reaching 31,000, and yet no operation was called for. It is noteworthy that, where successive counts were made, the numbers fell in all cases, except No. 38; and in this case there is a possibility that an abscess was present at first, but ruptured spontaneously into the bowel.

Group III.—In these the signs were again local, as in the two previous groups, and there was a definite tumour. The difference between these and the cases in Group II. is that pus was proved to be present, either by its evacuation at an operation, or by the sudden disappearance of the tumour, clinically suggesting rupture of an abscess into the bowel.

It will be seen that in a quarter of the cases there was nothing that could be called a leucocytosis at all. In three quarters the figures did not exceed the maximum found in Groups I. and II. In the remaining quarter there was so great a rise (34,000 to 56,000) that any case amongst the first two groups is quite eclipsed. If any rule could be laid down as to the minimum leucocytosis which, at one count, indicates pus with any certainty, the figure could not be less than 35,000; and when statistics from other hospitals are published it may prove to be higher still.

On the other hand, as has been already pointed out, it is from cases in this group that the value of a rising leucocyte-count may be gathered. Case 66 is a good example; Cases 64, 65, and 68 are others, no similar cases occurring amongst Groups I. and II. Unfortunately, all the earlier cases were observed before this point was realised; more evidence is needed, and in due course more cases will be recorded.

Case 65 is particularly interesting, in that it shows a fall after the appendicular pus was evacuated, and then a rise again as an empyema was collecting. It was the rise which was important here, not the absolute count, which was small.

It has been stated that no increase of leucocytes occurs when pus is enclosed in an old, thick-walled abscess-cavity. This seems not improbable, but there is no means of drawing

conclusions on this point from the present cases. All that can be said is that chronicity is no bar to leucocytosis. In cases 53 and 54 the patients had been ill more than a month ; yet there was a leucocytosis. Naturally it will be urged that pus had not, perhaps, been present all the time ; that is quite possible, and the condition of the abscess-wall has not been recorded.

Case 70 is of interest, being particularly difficult to diagnose. In the first place the trouble was in the *left* iliac fossa, the caecum being transposed to that side ; secondly, the abscess-cavity was resonant owing to gas produced by the *Bacillus coli communis*. Neither pulse, nor temperature, nor general condition made it certain that pus was present ; but the leucocytes were 56,750, and helped to turn the scale in favour of operation.

Group IV.—These are cases of appendicitis with general peritonitis ; the appendix was either primarily gangrenous, or was bathed in pus from an abscess which had burst into the peritoneum. The signs were no longer localised in the right iliac fossa, but general all over the abdomen.

Some of the cases were obvious ; others less easy of diagnosis. It is well known how deceptive the signs may be, owing to absence of pain or tenderness, to absence of a clear history pointing to the primary seat of the mischief, or to the possibility of symptoms being masked by opium given to relieve some previous pain.

Few patients belonging to this group have had their leucocytes counted. Most come into the hospital so obviously ill that laparotomy is performed at once. Of those cases which have been counted, half show 30,000 leucocytes or more. This is higher than the figures usually obtained ; more often there is no leucocytosis, as in the remaining half ; and this is usually attributed to the virulence of the infection. Leucocytosis is thought to depend upon chemiotaxis. Perhaps in a mild case there may be a small dose of toxine, and the chemiotactic effect on the leucocytes may be slight, so that they do not increase ; in a severe case there may be a large dose of toxine, the chemiotactic effect may be greater, and the leucocytes may increase : the dose of toxine may apparently be great enough even with non-purulent inflammation of the appendix to cause

leucocytosis ; and finally it seems that a very virulent toxine, as in a bad case of acute peritonitis, may prevent the leucocytes from increasing at all. Perhaps the number of leucocytes may thus afford a measure of the virulence of an attack, or of the lack of resisting-power in the patient ; but this is theoretical. As a diagnostic sign of acute peritonitis, the leucocytes are not to be relied upon. In this respect they may be compared with the temperature, which may be raised, or may be lowered, or may be normal. In diagnosing general peritonitis, far more stress must be laid upon the pulse-rate, the persistent sickness, the abdominal rigidity and immobility, and the *facies Hippocratica*, than upon either the leucocytes or the temperature.

ODD CASES.

Without making a fifth group, a few additional cases have been placed by themselves because they did not coincide with any of the four main groups. In four of these (77-80) suppurative pylephlebitis was present. In one only was the leucocytosis marked.

Cases 82 and 83 are examples of difficulties in diagnosing pus, the former because the abscess lay behind the cæcum, the latter because the trouble began in the left iliac fossa instead of in the right, the cæcum being transposed. In each of these the leucocytes reached 25,000, suggesting but by no means proving pus.

SEX AND AGE.

It might be thought that sex or age might have some definite influence on the leucocytosis. None such can be deduced from an examination of the 83 cases as a whole ; though it is a curious coincidence that the maximum counts in each of the groups occur in males.

COMPARISON WITH THE RESULTS OF OTHERS.

A full analysis of a similar group of cases has been published by Da Costa⁵ in America, and it is interesting to compare his results with those deduced from the present series. The following is his table for 118 cases :—

DA COSTA'S CASES.

Leucocytes.	Simple Catarrhal.		Any pus-case.	
	Acute.	Chronic.	Acute.	Chronic.
Above 50,000 -	-	-	1	-
40,000 to 50,000 -	-	-	-	-
35,000 to 40,000 -	-	-	2	-
30,000 to 35,000 -	-	-	-	-
25,000 to 30,000 -	-	-	3	-
20,000 to 25,000 -	-	-	14	-
15,000 to 20,000 -	-	4	30	-
10,000 to 15,000 -	-	2	19	3
5,000 to 10,000 -	-	8	7	1
Below 5,000 -	-	4	-	-
Total cases -	-	18	76	4
Highest -	-	17,000	15,000	14,600
Average -	-	9,124	9,190	8,800
Lowest -	-	1,600	2,400	12,425

And the following is a similar table of the present 83 cases :—

CASES OBSERVED BY THE AUTHOR.

Leucocytes.	Apparently no pus.		Abcess present.		General peritonitis, &c.
	Less than a week.	More than a week.	Less than a week.	More than a week.	
Above 50,000 -	-	-	-	-	-
40,000 to 50,000 -	-	-	1	1	1
35,000 to 40,000 -	-	-	2	1	1
30,000 to 35,000 -	2	1	-	1	-
25,000 to 30,000 -	1	3	1	2	1
20,000 to 25,000 -	3	5	1	4	2
15,000 to 20,000 -	3	1	2	4	1
10,000 to 15,000 -	10	5	3	1	4
5,000 to 10,000 -	5	6	1	1	1
Below 5,000 -	-	-	-	-	-
Total cases -	-	24	21	16	11
Highest -	-	31,000	31,600	49,000	41,000
Average -	-	14,165	16,885	23,068	20,608
Lowest -	-	6,875	8,300	7,500	7,128

It will be seen that, whereas Da Costa concludes that a leucocyte-increase to 20,000 means pus, this conclusion cannot be drawn from less than 32,000 by the present writer. The maximum, the minimum, and the average of the writer's "simple" cases are all greater than are those of Da Costa's. The maximum and the minimum of the cases with pus are similar in the two tables; but the average is higher in the author's cases than in Da Costa's. Perhaps the differences are partly attributable to differences in method, but more probably to the fact that cases vary very greatly, and that far more statistics are still needed before reliable averages can be struck.

THE DIFFERENTIAL LEUCOCYTE-COUNT.

It has been suggested that a differential leucocyte-count accompanying the count of total leucocytes may afford further valuable means of diagnosing latent pus. In purulent affections there is said to be a relative increase of the polymorpho-nucleated cells to 85 per cent. or even 90 per cent., in place of the more usual 65 per cent. Unfortunately this investigation was not carried out in the present instance except in Case 81. Here the polymorpho-nucleated cells reached 86 per cent., but the patient got quite well without an operation. Pus, if present at all, must have been absorbed, or have ruptured into the bowel; and there was no proof of either.

Da Costa⁶ states that he made differential leucocyte-counts on several cases, but found them useless; Longridge,⁸ on the other hand, publishing 20 cases from St. George's Hospital, gives differential counts in which 80 per cent. of polymorpho-nucleated cells occurred when pus was present, whereas when pus was absent these cells were usually less than 60 per cent. Further investigation is needed on this point.

DIAGNOSIS FROM OTHER CONDITIONS.

The present paper has dealt exclusively with leucocyte-counts in cases where appendicitis was the certain diagnosis. There is another aspect of the question, however: the

leucocytes may assist in the diagnosis of appendicitis from other things. Without enlarging upon this, mention may be made of cases of appendicitis simulating typhoid fever with abdominal symptoms. Not a few cases of appendicitis have presented signs so obscure that typhoid fever has been first diagnosed; but in the latter the leucocytes are diminished rather than increased, and a count of 15,000 has before now served to exclude typhoid fever and suggest appendicitis.

In cases of intestinal strangulation there is said to be little or no leucocytosis; not infrequently difficulties of diagnosis between obstruction and appendicitis have arisen. In such cases the leucocytes may help to solve the difficulty.

CONCLUSIONS.

The value of leucocytosis in relegating a given case of appendicitis to its proper group, and in deciding whether an operation should be performed or not, is apt to be over-rated. Its value, judged from the present cases, is even less than that deduced by other recent observers from the figures they have found. Many cases with 20,000 leucocytes have resolved spontaneously; many with 15,000 or less have had pus present. At the same time, leucocyte-counts have afforded valuable evidence in certain cases. In no case where the leucocytes have reached 35,000 has pus been absent. A rising count is of more importance than is the absolute number. Above all, leucocytosis is to be regarded as but one clinical sign amongst many. By itself it may mislead, but taken in conjunction with the pulse-rate, the temperature, and the general condition of the patient it is an additional sign which may be most valuable in the diagnosis of a difficult case.

Group I.—Signs local; no tumour; recovery without operation:—

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
1	F.	30	6	72	98·4	6,875	Uneventful recovery.
2	M.	13	3	76	99·0	7,890	Uneventful recovery.
3	M.	14	9	116	101·6	8,437	
			10	104	101·0	—	
			11	72	98·4	—	Uneventful recovery.
4	F.	15	8	80	99·2	8,500	Rapidly well.
5	M.	22	4	68	99·4	8,937	Uneventful recovery.
6	M.	20	9	66	98·6	4,600	
			11	56	98·8	9,500	Uneventful recovery.
7	F.	16	2	120	100·0	—	
			3	85	98·4	10,781	Uneventful recovery.
8	F.	17	7	112	101·0	11,000	
			8	100	100·2	—	Delayed resolution.
9	M.	21	1	112	100·2	—	
			2	92	99·8	11,000	Uneventful recovery.
10	M.	14	6	92	102·2	11,875	Temperature not down for four days.
			7	97	100·8	—	
11	F.	12	7	132	100·4	—	
			8	92	99·8	12,175	Operated on after convalescence; adhesions found; no pus.
12	M.	17	3	62	98·8	12,500	Uneventful recovery.
13	M.	20	2	100	100·0	12,500	Second attack.
			3	80	99·0	—	Uneventful recovery.
14	M.	13	1	100	100·0	13,000	
			2	80	98·0	—	Rapidly well.
15	F.	17	4	120	100·4	13,500	Operated on after convalescence; adhesions found; no pus.
			6	80	98·4	—	
16	M.	27	4	80	100·0	14,375	
			5	72	98·8	16,562	
			6	60	99·2	13,438	
			7	64	100·0	14,375	Operation discussed; not done.
			8	64	98·0	13,750	
			9	64	98·6	13,437	
			10	76	99·6	12,812	Uneventful recovery.
17	M.	39	4	92	100·4	16,800	Temperature not down for a week. Uneventful recovery.
			5	98	101·0	—	

Group I.—*continued.*

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
18	M.	18	2 3	96 102	101·0 101·4	18,200 —	Did not resolve for 10 days; then complete recovery.
19	F.	17	5 6 9	118 120 76	102·2 104·0 98·4	22,500 — 6,400	Sixth attack. Operated on after convalescence. Adhe- sions found; no pus.
20	M.	11	12 13	104 68	103·0 98·0	23,000 —	Rapidly well.
21	M.	36	1 2 3	96 100 92	101·4 100·2 99·0	31,000 — —	Very diffuse pain Got per- fectly well, but slowly.

Group II.—Signs local; definite tumour; recovery without operation:—

22	F.	18	23 24	104 80	97·6 99·0	8,300 —	Tumour not resolved for 2 weeks longer.
23	M.	9	10	88	98·0	8,500	Tumour resolved in 4 days.
24	F.	31	6	96	99·2	8,906	Tumour not quite gone till 16th day.
25	M.	42	19	80	98·4	9,062	Tumour not gone till 27th day.
26	M.	26	7	60	98·2	9,580	Rapid resolution.
27	F.	19	7 20	88 92	99·2 99·8	10,000 5,312	Small lump still palpable on discharge.
28	F.	19	15	80	97·4	11,000	Already getting better when seen.
29	F.	6	28 29	84 80	100·2 98·2	11,000 —	Uneventful recovery.
30	M.	18	13	72	98·4	11,384	Tumour slowly disappeared.
31	M.	29	14	92	98·6	12,800	Operated on after convales- cence; adhesions found; no pus.
32	F.	23	2	84	98·8	15,000	Operated on after convales- cence; adhesions found; no pus.

Group II.—*continued.*

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
33	F.	48	10 11 12 15 20	112 104 104 96 68	102·6 103·6 103·4 98·6 96·4	12,500 14,750 — 15,600 12,000	Large tumour. Tumour unaltered. Tumour unaltered. Operation decided against. Tumour gone; uneventful recovery.
34	M.	30	8	64	98·0	20,625	Complete recovery.
35	M.	12	2	88	99·0	20,987	Complete recovery.
36	M.	17	5 6 11 27	108 90 80 72	100·0 100·4 97·8 98·0	21,500 18,720 19,475 7,600	Large tumour. Tumour less. Tumour less, still present. Complete recovery.
37	M.	23	13	60	98·2	22,000	Lump known to have been present 10 days; slow but complete recovery.
38	M.	13	10 11 12	106 96 74	102·0 102·0 98·4	19,180 24,375 9,400	Rapid subsidence of tumour? ? rupture of abscess into bowel. Recovery.
39	M.	40	3 4	80 64	101·4 99·2	25,625 —	Rapid recovery.
40	M.	11	10 16	94 80	99·0 98·4	26,000 27,000	{ Apparent complete recovery. ? did leucocytosis indicate latent pus?
41	F.	16	10 11 12	88 86 88	101·6 100·4 101·6	28,750 — —	Operation much discussed, not done. Temperature still up several days. Tumour slowly resolved. Recovery.
42	M.	42	19 22 23 26	62 72 74 48	100·2 101·6 101·0 98·4	30,000 18,668 — 13,750	Large tumour; it increased for 5 days, operation often discussed. Decided against. Tumour shrank from 28th day; gone on 41st.
43	M.	9	4 6	100 96	101·0 99·0	30,625 22,395	Large tumour. Tumour gradually resolved in 5 days.
44	M.	12	28 30	96 80	99·0 98·4	31,600 18,750	Very delayed convalescence; no operation. Recovery.

Group III.—Signs local; definite tumour; Pus let out in most cases by operation; in four by rupture into bowel:—

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
45	M.	12	6 7	104 88	100° 2 98° 6	7,500 —	Operation. Copious pus.
46	M.	14	11 12	120 120	101° 4 101° 8	9,500 —	Operation. Pus found.
47	M.	31	4	68	99° 6	12,000	Operation. Pus found.
48	M.	11	5 6 8	108 100 130	103° 0 98° 4 100° 2	19,000 12,000 —	Operation. Pus found.
49	M.	11	3 4	120 100	104° 4 99° 4	12,500 —	Operation. Pus found.
50	M.	41	16 17	96 88	100° 0 101° 6	12,500 12,500	Operation. Pus found.
51	F.	47	8 15 16 17 18	78 100 112 108 108	98° 4 101° 6 101° 6 99° 6 101° 6	10,200 — — — 15,437	Large tumour. Tumour bigger. Operation. Pus found.
52	F.	19	2 3	114 108	102° 0 101° 2	15,670 —	Operation. Pus found.
53	M.	27	31	76	101° 0	17,062	Operation. Pus from caecum to kidney.
54	M.	10	40	112	98° 6	19,062	Operation. Pus found.
55	M.	8	9	96 90	99° 0 98° 4	20,000 —	Operation. Pus found.
56	M.	24	7 8 9	96 100 100	101° 2 103° 4 102° 8	20,000 19,300 —	Operation. Pus found.

Group III.—*continued.*

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera-ture.	Leuco- cytes.	Remarks.
57	M.	17	14	104	101·0	20,200	
			15	104	102·2	—	
			16	73	99·2	19,800	
			17	62	98·6	5,000	Rupture abscess into cæcum. Spontaneous recovery.
58	F.	21	4	124	101·4	21,000	
			5	100	100·6	—	Operation. Pus found.
59	M.	45	3	108	99·0	17,000	Large tumour.
			4	100	99·0	21,000	Operation refused by patient.
			6	84	99·0	17,000	
			9	88	99·0	19,000	
			11	104	101·0	23,000	Operation refused by patient.
			12	100	100·0	21,000	Sudden rupture abscess into bowel.
			13	96	98·4	17,000	Spontaneous recovery.
			10	96	99·4	23,000	
			11	98	101·6	19,000	
			12	112	101·4	16,800	
60	M.	39	13	120	100·4	18,750	
			14	100	100·2	18,000	
			16	72	98·4	13,470	Operation. Pus let out.
			17	72	98·4	16,400	
			18	68	98·0	7,500	Rapid recovery.
			10	96	99·4	23,000	
			11	98	101·6	19,000	
			12	112	101·4	16,800	
61	M.	11	3	130	97·6	26,000	Operation. Pus found.
62	M.	52	14	104	100·0	26,250	
			15	100	99·0	25,687	Operation. Pus let out.
			16	96	99·0	21,250	
			19	104	98·4	21,250	
			21	92	98·4	10,000	Uneventful recovery.
			12	100	101·0	14,000	
63	F.	22	21	84	100·4	30,000	Large tumour.
			25	108	100·4	—	Tumour persistent.
64	M.	21	7	88	101·6	21,600	Operation. Pus found.
			8	100	101·8	34,062	
			16	80	98·4	14,400	Operation. Pus let out.
			21	80	98·4	14,400	Fœcal fistula.
			22	80	98·4	7,000	Slow, but complete recovery.

Group III.—*continued.*

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
65	M.	32	10 11 12 14 19 25 36 49	112 134 134 112 118 120 130 70	101° 0 101° 0 101° 0 101° 0 101° 0 101° 0 102° 0 98° 4	38,000 32,500 31,760 20,938 10,937 13,281 15,625 8,912	Operation. Pus let out. Rub first heard in chest. Extensive pleurisy. ? Empyema. Empyema drained. Getting rapidly well.
66	M.	12	2 3 4 7	75 76 72 80	100° 2 99° 2 98° 6 100° 6	7,800 9,062 11,875 38,700	Operation. Pus let out.
67	M.	6	6 7	112 96	97° 0 96° 6	39,375 —	Sudden disappearance of large tumour. Ruptured into caecum.
68	F.	14	10 14 15 16	96 104 80 80	100° 2 99° 0 99° 0 98° 4	18,000 42,000 22,000 7,000	Large tumour. Tumour larger. Sudden disappearance of tumour. Ruptured into caecum.
69	F.	14	4 5 19 22	124 128 100 96	101° 6 99° 8 100° 8 98° 8	49,000 21,000 — —	Operation. Pus let out. Temperature not down for over a fortnight. Complete, but slow recovery.
70	M.	24	15 21 26	100 92 80	100° 8 99° 8 98° 4	56,750 — 18,437	In this case the caecum was in the left iliac fossa; and the abcess contained gas and was resonant. Operation. Pus let out.

Group IV.—Appendicitis with general peritonitis :—

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
71	M.	14	1	128	102·4	7,128	Laparotomy, general peritonitis. Slow, but complete recovery.
72	M.	12	4	130	102·0	10,625	DIED the same night.
73	F.	17	2	136	102·0	10,800	Decided not to be dangerous.
		4	100	100·0		8,125	Thought to be better.
		6	102	100·0		7,500	
		14	90	101·0		8,437	Operation still thought not to be indicated.
		17	118	101·0		10,625	Operation. Suppurative peritonitis.
		22	180	105·4		—	DIED.
74	M.	11	Same day.	144	103·6	30,000	Laparotomy; general peritonitis; cured.
75	M.	16	1	122	100·6	20,000	Operation thought not indicated.
		2	104	100·6	17,000		
		3	100	99·8	19,500		
		7	110	101·0	—		
		9	154	101·8	31,500		Laparotomy; suppurative peritonitis.
		13	?	100·4	37,500		
							Worse. Pus under diaphragm.
							DIED. Pus all over peritoneum.
76	M.	8	9	124	100·4	39,687	No great rigidity. Doubtful whether to operate. Laparotomy showed acute general peritonitis, and cæcum in left iliac fossa.
		10	130	100·4		41,000	
		11	80	99·4		9,312	Rapid recovery.

Seven cases not belonging strictly to any of the four preceding groups :—

No. of Case.	Sex.	Age.	Days since Onset.	Pulse.	Tem- pera- ture.	Leuco- cytes.	Remarks.
77	F.	28	6	124	102·4	10,500	Appendicitis and suppurative pylephlebitis, not diagnosed till autopsy.
78	M.	23	35	60	95·0	12,154	Gangrenous appendicitis and suppurative pylephlebitis, not diagnosed till autopsy.
79	M.	19	27 29 44 58	112 112 110 114	104·6 105·0 102·0 103·0	24,000 23,000 24,100 20,625	A very obscure diagnosis. All sorts of things suggested. At autopsy an inflamed appendix and suppurative pylephlebitis were found.
80	M.	22	19 20 23	140 124 180	104·0 100·4 100·0	18,000 16,000 —	Gangrenous appendicitis, general peritonitis, and suppurative pylephlebitis found at autopsy.
81	M.	30	4 5 7 9 11 12 14 15	112 120 100 116 100 100 90 92	102·8 102·0 100·6 101·2 100·0 100·0 98·4 98·4	23,800 17,700 13,300 13,432 8,755 11,400 6,500 8,300	Symptoms all suggested general peritonitis secondary to an abscess; but patient recovered completely without operation. <i>Differential leucocyte-count :</i> Small lymphocytes - 8·0 % Large lymphocytes - 5·0 % Polymorphonucleated 86·5 % Eosinophiles - - 0·5 %
82	F.	20	13 16	108 84	100·8 101·4	25,000 10,000	Clinically seemed to belong to Group I., local, without tumour. But operation on 13th day evacuated much pus from behind cæcum. Good recovery.
83	M.	23	7	92	101·2	25,000	Clinically a mild case, with no rigidity or pain. Operation postponed to 10th day; died same night, general peritonitis being present. The previous pain had all been on the <i>left</i> side, and the cæcum was found transposed to this side.

LITERATURE.

¹ Carmichael, E. S.: "Leucocytosis in Abdomino-Pelvic Disease." *British Medical Journal*, 1903, Part II., p. 1466. [Full paper before Edinburgh Obstetrical Society.]

² Cazin and Gros: "Revue Critique : De la leucocytose dans l'appendicite." *La Semaine Médicale*, 1903, pp. 141-145.

³ Coste, Dr.: "Ueber das Verhalten der Leukocyten bei Appendizitis." *Münchener medicinische Wochenschrift*, 1902, pp. 2038-2042.

⁴ Curschmann, Dr.: "Leucocytosis in the Diagnosis of Appendicular Abscess." *Wiener klinische Wochenschrift*, December 26, 1901.

⁵ Da Costa, J. C.: "The Clinical Value of Blood Examinations in Appendicitis: a Study based on the examination of 118 cases at the German Hospital, Philadelphia." *American Journal of the Medical Sciences*, 1901, pp. 645-654.

⁶ Deaver, J. B.: "The Examination of the Blood in relation to Surgery: of scientific but often of no practical value, and may mislead the surgeon." *Philadelphia Medical Journal*, 1901, pp. 1055-1057.

⁷ Kühn, A.: "Zur diagnostischen Bedeutung der Leukocytenwerte bei Typhus abdominalis und bei chirurgischen Eiterungen." *Münchener medicinische Wochenschrift*, 1902, pp. 2033-2038.

⁸ Longridge, C. N.: "Leucocytosis in Appendicitis." *The Lancet*, 1902, Part II., pp. 74-75.

⁹ Wassermann, M.: "Ueber das Verhalten der weissen Blutkörperchen bei einigen chirurgischen Erkrankungen, insbesonder bei Appendicitis." *Münchener medicinische Wochenschrift*, 1902, pp. 751-755.



A SIMPLE METHOD OF ESTIMATING THE
NUMBER OF LEUCOCYTES IN THE
BLOOD ; AND LEUCOCYTOSIS CONSIDERED AS A
GUIDE TO THE DIAGNOSIS
OF APPENDICITIS.

BY DRs. MAURICE GAZIN AND EDMOND GROS.¹

*Translated and Abridged by FLEET-SURGEON OCTAVIUS W. ANDREWS,
M.B., R.N.*

METHOD OF MAKING THE COUNT.

A CONVENIENT method of making the count is by means of the haematiometer of Hayem. This instrument has a movable plate which allows the drop of blood which is being examined to be moved in a systematic manner, and thus permits a count of the leucocytes which it contains to be made in a methodical way. The blood is taken with the usual precautions by a prick with a lancet, which has been passed through the flame of a spirit-lamp, the finger having first been sterilised either on its dorsal or its palmar aspect—the former by preference, so as to avoid all subsequent inconvenience in taking hold of things. In order to simplify calculation, in multiplying the number of blood-cells contained in the field of the microscope we use a special pipette which enables us to draw off 20 cubic millims. of blood, and in which the clotting, which occurs so readily with the ordinary small 2-c.m. variety, is avoided. After the excess of blood which adheres to the end of the pipette has been wiped away, it is completely emptied into the measure into which 500 cubic millims. of 5-per-1,000 acetic acid have already been put; this is done in order to destroy the red corpuscles and bring into view the nuclei of the leucocytes.

The mixture is carefully shaken, so as to ensure an equal distribution of the leucocytes. Six cubic millims. of fluid generally adhere to the pipette used for measuring the solution: it therefore follows that in reality the solution to which

¹ *La Semaine Médicale*, May 6, 1903.

the 20 cubic millims. of blood were added only amounts to 494 cubic millims.

NATURE OF CALCULATION REQUIRED.

The calculation which enables us to determine the number of leucocytes contained in a cubic millim. of blood depends upon the answers to the following questions :—

1. *How much blood is there in a cubic millim. of the mixture which we have just described ?*—This mixture measures $494 + 20 = 514$ cubic millims. and these 514 cubic millims. contain 20 cubic millims. of blood ; therefore 1 cubic millim. of the mixture contains $\frac{20}{514}$ c.mm. of blood.

2. *How much blood is there per square of the hæmatimeter ?*—Each square corresponds to a cube whose side is 0.2 millim., that is to say, to a volume of 0.008 cubic millims. of the mixture under examination. Now we know that 1 cubic millim. of this mixture contains $\frac{20}{514}$ cubic millim. of blood. Then in 0.008 cubic millim. there is $\frac{20 \times 0.008}{514}$, i.e., $\frac{1}{514}$, or in round numbers, $\frac{1}{500}$ of a cubic millim. of blood. If, for example, a square shows 5 leucocytes, we then know that $\frac{1}{500}$ cubic millim. of blood contains 5 leucocytes and that consequently 1 cubic millim. of it contains 3,200 times as much, viz. $5 \times 3,200$. But when several squares of the same preparation are examined in succession the same number of leucocytes are not always found. We must then count the white cells in a certain number of squares and take the mean of the numbers so obtained. If, for example, in displacing the drop of fluid in such a way that the preparation is examined from side to side, and from back to front, 285 leucocytes are found in a total number of 52 squares, we conclude that each square contains on an average $\frac{285}{52}$ leucocytes, and that the number of these elements per 1 cubic millim. is, in consequence, equal to $\frac{285}{52} \times 3,200$. M. Hallion, who has been kind enough to explain the technique of this method to us, has recourse to a very simple plan for simplifying the calculation. It consists in counting the leucocytes in 32 squares ; suppose, for example, that we find in these 32 squares a total of 314 leucocytes ; we at once know that each millim. of blood contains $\frac{314}{32} \times 3,200$ or, more simply, $314 \times 100 = 31,400$

In short, working in the way we have just said, we add up the totals of leucocytes contained in 32 squares of the haemmatimeter, and it will be quite sufficient to multiply by 100 the number so obtained to have immediately and without further calculation the number corresponding to that contained in 1 cubic millim. of blood.

When performed in this way, an examination for leucocytosis only takes a few minutes. If one wishes to obtain extremely accurate results, several counts must be made and the mean taken of several series of counts each consisting of 32 squares. At least two series of enumerations should be made, and if with these two series of 32 squares two numbers practically the same are obtained, the mean of these may be taken as the result. But if, on the contrary, there is a certain amount of discrepancy between them, several counts must be made, because the greater the number of counts that are made the more nearly does the mean become approximated to the exact number. If one is not sufficiently accustomed to the microscopic examination of blood it is allowable to have recourse to one of the processes of staining for bringing the leucocytes into prominence, instead of using the solution of acetic acid to destroy the red corpuscles. The method of MM. Regaud and Barjon in particular enables us to stain the leucocytes with gentian violet,¹ but as a general rule these methods are much less rapid than that which we have just been discussing, because the colouring matter always requires some time to act on the white corpuscles.

Mr. J. B. Deaver² has rightly insisted on the necessity for a mode of examination free from error, for upon its exactness depends the value of the count. One mistake in the technique is sufficient to give unreliable results, but only a very short apprenticeship is necessary to make oneself sufficiently expert to perform the examination with accuracy; this apprenticeship is, however, absolutely indispensable. In order to acquire the necessary skill it is well to examine the blood of either

¹ Mayet: "Some notes as to the best means to employ in order to perform with exactitude the enumeration of the white cells." (*Lyon Med.*, 3 February, 1901.)

² J. B. Deaver: "The examination of the blood in relation to surgery, of scientific but often of no practical value, and may misguide the surgeon." (*Philadelphia Med. Journal*, 1st June 1901.)

a healthy or a sick person, and to take several specimens at the same time on each occasion from a fresh puncture; on making the calculation, numbers practically identical ought to be obtained. Until this degree of proficiency is attained no attempt to count the leucocytes for diagnostic purposes as regards appendicitis should be made, otherwise the information might be misleading.

HISTORY OF BLOOD-EXAMINATIONS.

In regard to the history of blood-examinations for the diagnosis of suppuration, M. Hayem¹ was the first to demonstrate the utility of these examinations in the case of suppuration in the abdomen in general and perityphlitis in particular; next came Rieder,² Von Limbeck,³ Grawitz and Cabot, who some time ago pointed out that there was an increase in the number of leucocytes in a certain number of acute inflammatory affections, especially when these were accompanied by circumscribed collections of pus; but it was clearly Curschmann⁴ who introduced the systematic counting of the white corpuscles for the diagnosis of suppuration due to appendicitis. (Vide *Semaine Médicale*, 1902, p. 129.) In Germany in consequence of Curschmann's work it has been proposed to call the phenomenon of leucocytosis in appendicitis by the name of "Curschmann's sign": in our opinion it would be fairer to call it "Hayem's sign," because it is not a phenomenon peculiar only to suppuration connected with the appendix, and it would seem that although Curschmann was the first to apply the examination of blood for leucocytosis to the diagnosis of appendicitis, it was really Hayem who originally drew attention to its importance in assisting to recognise certain abdominal affections otherwise often difficult to make out, such as *perityphlitis*, perihepatitis, perinephritis, &c. It is quite clear that M. Hayem was the first to point out the importance of leucocytosis as a diagnostic

¹ G. Hayem: "*Du sang et ses altérations anatomiques*," Paris, 1889.

² Rieder: *Beitrag zur Kenntniss der Leucocytose und verwandter Zustände des Blutes*, Leipzig, 1892.

³ Von Limbeck: "Klinisches und Experimentelles über die entzündliche Leucocytose." *Zeitsch. f. Heilk.*, X., p. 392, and *Semaine Médicale*, 1889, p. 435.

⁴ Curschmann: "Zur diagnostischen Beurtheilung der vom Blinddarm und Wurmfortsatz ausgehenden entzündlichen Processe." *Münch med. Wochensch.*, 26 November and 3 December 1901, pp. 1907 and 1962.

aid in perityphlitis. But the memoir of Curschmann, which was based on the results of 60 observations, did more to point out the important place which leucocytosis holds amongst the other signs of appendicitis, especially as regards the diagnosis of abscess, and these were without a single exception confirmed by surgical intervention in all those cases where a few days after the commencement of the attack he had found the number of leucocytes equal to, or higher than, 25,000. Even at the same period there appeared in America an important work by Da Costa¹ giving the results of the examination of the blood in 118 cases of appendicitis which were operated on. Early in 1902, Ch. Bäumler² published a memoir in which he recommended the enumeration of leucocytes in appendicitis. The same year numerous works appeared on the same subject, e.g., those by Küttner, Sauerbruch, Schnitzler, Longridge, Wassermann, &c., &c., and lastly, quite recently Wassermann has again reverted to the question, bringing fresh facts in support of Curschmann's opinions. From the mass of these works we have endeavoured to come to some practical conclusions, the importance of which is beyond question.

COMPOSITION OF NORMAL BLOOD.

The number of white corpuscles in the blood of the normal adult man averages 7,500 per cubic millim. (Malassez); it varies from 8,000 to 10,000 according to Curschmann, 7,000 to 9,000 (Küttner), 4,000 to 11,000 (Wassermann). In children it is generally higher and less constant than it is with the adult. As a general rule we may say that when there are more than 10,000 leucocytes per cubic millim. of blood, there is leucocytosis.

LEUCOCYTOSIS IN PERITYPHLITIS.

Contrary to what is generally supposed, leucocytosis is usually present from the very beginning of an attack of appendicitis, without there being the slightest suppuration. Curschmann is very decided on this point, and considers it

¹ J. C. Da Costa : "The clinical value of blood examinations in Appendicitis." *American Journ. of the Med. Scin.*, Nov. 1901.

² Ch. Bäumler : "Klinische Erfahrungen, über Behandlung der Perityphlitis." *Deutsch. Arch. f. klin. Med.*, 1902, LXXIII.

absolutely proved: "in the vast majority of all forms of perityphlitis, from the commencement, the number of leucocytes is increased." In mild cases this increase is usually less considerable, the number of leucocytes most frequently varying between 10,000 and 15,000 per cubic millim., but it may reach as high as 19,000 or 20,000, as we have seen it from the second to the third day, in cases where no abscess occurred. Nevertheless the increase in such cases is very transitory, and the number falls the following day from 20,000 to 12,000, 10,000, or even 6,000.

The following table, borrowed from Curschmann, may perhaps be regarded as a typical example of a mild case, rapidly ending in recovery, in which an increase in the number of leucocytes was observed on the second day, followed by a gradual return to the normal number:—

	Leucocytes per Cubic Millimetre.			Temperature.	
2nd day	15,600	-	-	38·5 C.	or 101·3° F.
3rd day	Morning 20,000	-	-	37·8 C.	„ 100·4° F.
	Evening 12,400	-	-	37·6 C.	„ 99·68° F.
4th day	Morning 10,400	-	-	37·2 C.	„ 98·96° F.
	Evening 11,400	-	-	37·4 C.	„ 99·32° F.
5th day	Morning 12,600	-	-	36·6 C.	„ 97·88° F.
	Evening 10,800	-	-	37·2 C.	„ 98·96° F.
6th day	Morning 7,200	-	-	36·8 C.	„ 98·24° F.
	Evening 8,800	-	-	37·4 C.	„ 99·32° F.
7th day	6,800	-	-	37·0 C.	„ 99·00° F.

Sonnenburg, in his report to the Congress of the "Société belge de Chirurgie," which was held at Brussels in September, 1902, communicated the results which his assistant, Feddermann, had obtained in respect to the enumeration of leucocytes. He agrees with M. Curschmann that the reaction to which peritonitis gives rise, causes, from the beginning of the attack, a marked increase in the number of white corpuscles in the blood, in all its forms, be they mild or severe.

All the authors who have sought to verify the statements of Curschmann have confirmed his conclusions, having as a rule observed the number of leucocytes to vary between 11,000 or 12,000 and 15,000 at the commencement of those cases which end in resolution.

Besides, these statements are quite in accord with results obtained experimentally, particularly those published some time ago by Schulz,¹ who showed, in the case of a dog, that even when the peritoneum is merely irritated by an aseptic incision beneath the linea alba and immediately closed, considerable leucocytosis may sometimes ensue, which can attain to a proportion of 54,000 leucocytes per cubic millim. of blood. In the same way Wassermann has established the fact that laparotomies performed simply for the purpose of removing the appendix, without the existence of any abscess, are always followed by leucocytosis; the number of leucocytes prior to the operation being absolutely normal, and varying between 7,800 and 8,500, but going up to 14,000, 14,600, or 20,800 after the operation, and returning at once to normal without there being the slightest sign of infection. It has then been clearly shown that irritation of the peritoneum even under aseptic conditions gives rise to leucocytosis.

Every case of appendicitis which occasions the slightest inflammation of the peritoneum is accompanied by an increase in the number of leucocytes in the blood, except in certain hypertoxic forms where there is not time for the defensive substances of the body to be produced in sufficient quantities. At the commencement of a case there is no appreciable difference as regards the number of leucocytes, between the cases which should end in resolution and those which go on to suppuration. One single count cannot help us at the commencement of a case to diagnose the particular form of appendicitis with which we have to deal, and it is only by counts repeatedly made in a systematic manner morning and evening that we can, as we have just seen, distinguish between those cases which tend to resolve and those which are going to terminate in abscess. So, as a guide to operation, the examination of the blood at the outset of a case of appendicitis does not afford us any information, and the principle of early intervention on the first or even the second day still remains, in our opinion, the only means for preventing what may always be a fatal ending; apart from an operation there is no sign

¹ G. Schulz : "Experimentelle Untersuchung über das Vorkommen und die diagnostische Bedeutung der Leucocytose." *Deutsch. Arch. f. klin. Med.*, 1893, L I. 2-3.

which enables us to foresee at this stage whether the issue of the case will be favourable or grave.

But if leucocytosis is not of use for diagnosing the form of appendicitis at the beginning of an attack, it is a sign which must none the less be looked for, if only as a means for diagnosing the existence of appendicitis in a doubtful case. When it is ascertained that there is an increase in the number of leucocytes, even if this increase is only a slight one, it nevertheless favours the diagnosis of appendicitis, and allows us to eliminate all other affections accompanied by hypoleucocytosis or in which there is no alteration in the number of leucocytes.

Although we have said that a single count at the outset of a case of appendicitis gives us no information as to the severity or otherwise of the case with which we have to deal, yet it must not be thought that it is so also with several examinations repeated systematically once or twice a day. Speaking generally we may say that in the mild cases which end in resolution the number of leucocytes does not exceed 20,000 or 25,000, and that an increase under these conditions is very transitory.

We have collected 17 mild cases, ending in resolution, where the count of the leucocytes had been made systematically : six times only it has not exceeded 15,000 ; twice it has reached 15,400 ; six times the maximum has been from 18,000 to 20,000 ; and three times it has varied between 20,200 and 22,900. Wassermann also quotes some cases which were not operated on, where the number reached as high as 25,000 ; but these high figures were never observed in two successive enumerations, and in mild cases it is, so to speak, a constant thing to see the number of leucocytes, after it has reached 18,000 or 20,000, drop next day to 10,000 or 12,000.

We can then agree with Curschmann, that if the number of leucocytes only undergoes a slight increase we are justified in hoping that the case will run a comparatively short course, and end in resolution, and also that if the leucocytosis, carefully estimated on several consecutive days, remains slightly elevated or undergoes a marked increase (20,000 to 25,000) which is very transitory, we can safely count on the case ending in resolution, when a very slight rise of temperature, or even a fall in temperature, would not justify the same hopefulness. If there is one point in regard to the treatment of appendicitis

upon which all surgeons seem to be agreed, it is the necessity for early intervention when an abscess is present. Whatever those people may say who talk of the absorption of an abscess, the existence of which, by the way, they cannot prove, one can hardly depend on the absorption of a true collection of pus, which, however perfectly circumscribed, may at any time empty itself into the peritoneal cavity and so give rise to a rapidly fatal generalised peritonitis. As regards the spontaneous opening of the abscess into the bowel, this can scarcely be regarded, except in certain lucky cases, as a favourable solution of the difficulty.

But if, as we have already said, surgeons are quite agreed as to the importance of evacuating an abscess due to appendicitis, they are also equally agreed as regards the difficulty which often exists in determining with certainty whether or not an abscess is present. It is in cases of this kind that the value of the blood-count is shown, in enabling us to recognise early the existence of an abscess in those cases where other indications are wanting. The observations of Curschmann have shown that the curves formed by plotting out the results of leucocyte-counts which have been made systematically over and over again, are more reliable as aids to diagnosis than the temperature-curves : hyperleucocytosis is, so to speak, a constant sign of suppuration, whereas fever may be only slight or sometimes even absent notwithstanding extensive suppuration. Küttner, Sauerbruch, Coste and Kühn are also supporters of these assertions. In the same way Wassermann considers persistent hyperleucocytosis as pathognomonic of the formation of an abscess, and that it shows the time when the physician must retire in favour of the surgeon. According to this author, such a means of diagnosis is an inestimable benefit, since the need for operation in the case where there is suppuration cannot be clearly determined by other symptoms. As has been said before, leucocytosis at the commencement of a case does not allow of any decided opinions as regards the way the case will turn out, notwithstanding a high temperature or severe local pain, even when the increase in the number of white corpuscles is *momentarily* great, as, for instance, when it is from 20,000 to 25,000 per cubic millim. of blood. But when, on the other hand, the number of leucocytes undergoes a marked *permanent*

increase it clearly indicates that there is suppuration, whatever indications may be furnished by the other symptoms. The two following tables, borrowed from Curschmann, are good examples of the clearness of the information afforded by ascertaining the existence of leucocytosis which is high but not transitory. The first is that of a case treated by operation on the third day in consequence of the results shown by the blood-count; in this case the operation resulted in the evacuation of half a litre of foetid pus:—

		Leucocytes per Cubic Millimetre.		Temperature.
2nd day	- - - -	25,800	-	38·4° C. or 101·2° F.
3rd day	Morning - -	26,600	-	38·2° C., 100·76° F.
	(operation) Evening - -	24,000	-	40·1° C., 104·18° F.
4th day	- - - -	16,400	-	36·9° C., 98·42° F.
5th day	- - - -	8,000	-	36·6° C., 97·88° F.
6th day	- - - -	9,200	-	36·3° C., 97·34° F.

The second table deals with a case of appendicitis, the blood being taken on and after the third day of the disease. Operation was not performed till the eighth day, despite the fact that the increase in the number of leucocytes, which was observed on the fifth, continued, whilst the temperature remained comparatively little raised; the operation allowed the escape of a large quantity of pus:—

		Leucocytes per Cubic Millimetre.		Temperature.
3rd day	- - - -	8,350	-	39·4° C. or 102·92° F.
4th day	- - - -	10,200	-	39·0° C., 102·2° F.
5th day	- - - -	26,250	-	38·3° C., 100·94° F.
6th day	- - - -	29,000	-	38·0° C., 100·4° F.
7th day	- - - -	34,000	-	38·2° C., 100·76° F.
8th day	- - - -	39,000	-	38·3° C., 100·94° F.
	(operation).			

Drs. Maurice Gazin and Edmond Gros, the authors of this paper, quote a case which occurred in their own experience; it was as follows:—A boy, aged 15, suffering from appendicitis, was seen on the third day of the disease; his temperature was

104·0° F., and pulse only 80 ; the blood-count showed 8,500 leucocytes. On the fifth day the temperature dropped and the general condition was excellent, but, 48 hours later, the blood, which had not been examined for two days, showed as many as 31,000 leucocytes per cubic millim. ; the temperature in the rectum was only 99·68° F., and the pulse 80 ; locally there was only a slight resistance in the iliac fossa, accompanied by a slight amount of fulness. The patient was at once operated on, and a retro-cæcal abscess as large as a hen's egg was evacuated ; he made an uninterrupted recovery.

This last case is particularly interesting as showing the precision with which an examination of the blood enables a diagnosis of appendicitis to be made, even when the physical signs are uncertain or not well marked, and when the pulse and temperature are normal or scarcely modified. Dieulafoy has rightly drawn attention to the deceptive calm which often in cases of appendicitis follows a well-marked and painful beginning, during which time the peritoneal lesions are going on all the same in the most rapid and dangerous way despite the apparently benignant appearance of the symptoms. We shall not be misled by this calm if we systematically practise blood-counts.

No standard of leucocytosis can be laid down even approximately as to the number of white corpuscles met with in cases where there is an abscess due to appendicitis. Leucocytosis is merely a defensive reaction which may be influenced by many varying circumstances and under conditions most difficult to understand. Nevertheless, we are able to say what takes place in benign cases terminating in resolution ; in these cases the number of leucocytes, as we have already said, usually varies between 10,000 and 15,000, and only for a very short time does it ever exceed 20,000 ; whereas, in the cases where there is an abscess, the number varies around a figure not less than 20,000 most persistently, and very frequently goes on steadily increasing, so that it may attain numbers never met with in non-suppurating cases, such as 30,000, 35,000, 40,000, or even 45,000.

All the published facts show that there is no agreement between the temperature and leucocytosis ; the latter may be very great whilst the temperature is normal or only slightly

raised. On the other hand the study of observations, where repeated examinations of the blood have been made during the progress of a case of appendicitis, prove beyond dispute that it is to the leucocytosis and not to the temperature that we must look for information as to the necessity for operation.

Drs. M. Gazin and E. Gros quote a number of cases, both from their own experience and that of other eminent observers, which must have ended fatally were it not that successful surgical intervention was practised solely on the strength of results furnished by the blood-examination—cases in which the other signs of abscess were wanting. They also quote one striking case where the blood-count showed unmistakably that there was an abscess; yet the temperature and pulse were both low (99·6° F. and 90 respectively), and though an operation was recommended, it was not performed, with the result that the patient died from a large abscess breaking into the general peritoneal cavity.

RESTRICTIONS ON THE VALUE OF BLOOD-COUNTS.

Notwithstanding the unanimity with which surgeons have received the results of Curschmann, Grawitz, in the new edition of his treatise on Hæmatology,¹ mentions some restrictions which must be placed on the value of leucocytosis in the diagnosis of abscess. He quite admits, which for that matter is undeniable, that a *positive* reaction as regards leucocytosis, furnished by an examination of the blood, may give the clearest information and point to a diagnosis of appendicitis calling for operative interference. But, on the other hand, a *negative* result does not show for certain that there is not an abscess. This point must be clearly understood, in order to appreciate at its true value the importance of the blood-count in appendicitis. None of those who have advocated the practice of this sign have ever claimed that it is pathognomonic of suppurations connected with the appendix. Its use is fully justified when it is considered that a certain number of leucocytes infallibly indicates an abscess and shows the need for an operation, which, if performed without delay, results in the recovery of

¹ E. Grawitz : "Klinische Pathologie des Blutes, nebst einer Methodik der Blutuntersuchungen und spezieller Pathologie und Therapie der Blutkrankheiten." 2nd edition, p. 557, Berlin, 1902.

the patient. Regarded in this light no exception can be taken to the value of Hayem's sign, for on every occasion that it has been performed systematically and has furnished positive evidence leading to immediate intervention, the surgeon has always found pus and the patient has been cured.

It is nevertheless true, without detracting in any way from the certainty of *positive* results, that there may be an absence of marked leucocytosis even when suppuration exists, and this *negative* result seems to have been met with only under two widely different conditions :—(a) In the first class of cases of this sort, it is met with where there is suppuration which is not circumscribed, as for example in certain cases of diffuse hyper-toxic peritonitis where the defensive powers of the body have completely failed; then the number of leucocytes is only slightly raised or even below normal. (b) In a second class of cases it is met with where there is an encysted abscess remaining after the acute stage has been passed: here leucocytosis is also absent. Abscesses of this description are enclosed in a thick fibrous wall, which does not allow of the absorption of the toxines which have been formed in the abscess-cavity. And it is evident that it is the absorption of these toxines and their dissemination in the general circulation which brings about leucocytosis. The more recent the abscess is, the more easily is the toxine absorbed; in an old encysted abscess with a fibrous envelope this absorption cannot take place.

McBurney, when asked his opinion as to the value of leucocytosis as a guide to operation in appendicitis, agreed with the authors as to its value, subject to the same restrictions as have been given above, and he says that in all doubtful cases he would not hesitate to employ the blood-count as a means of diagnosis.

In regard to suppuration where leucocytosis is absent, only a limited number of cases of diffused general peritonitis, rapidly ending in death, have occurred in which the blood-count has been made. Curschmann says he has not sufficient facts to hand dealing with cases of this sort as regards blood-changes; but nevertheless he is of opinion that the number of leucocytes increases largely at first and then rapidly diminishes to normal or even below the normal number.

Rieder, Küttner, Kühn, and Coste have noted the absence

of leucocytosis in fulminating cases of peritoneal septicaemia where the organism has not had time to react. Da Costa has recorded twelve cases ending fatally : out of these leucocytosis was only absent twice, the number of leucocytes not having exceeded 6,000 or 11,000 ; in the other ten cases the average number was 19,400, with a minimum of 14,200 and a maximum reaching as high as 58,500.

This absence of leucocytosis, notwithstanding the gravest clinical signs, must be looked upon as an extremely serious prognostic sign, because it shows to how great an extent the natural resistance of the body has been reduced. But when, on the other hand, in cases of generalised peritonitis there is leucocytosis, it shows there is still some power of resistance, and renders the prognosis after operation comparatively hopeful. Küttner found this in a case of this kind ending in recovery where 50,000 leucocytes per cubic millim. were found. Wassermann quotes a case of diffuse general peritonitis where the blood-count made on the first day and followed by persistent leucocytosis caused them to operate on the second day ; even then the leucocytosis was very marked, as is shown by the following table, and this case ended in recovery.

	Leucocytes per Cubic millimetre.	Temperature.		
1st day	23,000 -	—	—	—
2nd day	Morning 25,100 -	39° 3' C. or 102° 74' F.	Pulse 102	
	4 p.m. 40,000 -	38° 1' C., 100° 58' F.	„ 126	
	(operation)			
	7 p.m. 46,000 -	38° 5' C., 101° 3' F.	„ 102	
3rd day	Noon 5,600	—	—	—
	7 p.m. 9,500 -	38° C., „ 100° 4' F.	„ 120	
4th day	Noon 5,500 -	38° C., „ 100° 4' F.	—	
	7 p.m. 6,500 -	37° 5' C., 99° 5' F.	„ 108	

Wassermann particularly calls attention to the fact that in this case, where an operation had shown the existence of diffused general peritonitis, the leucocytosis was in marked contrast with the clinical signs which were less severe : there was no "abdominal expression," the pulse was 102, full and regular, and the abdomen only very slightly tender and distended. It is perhaps well to add that on the second day

the persistent leucocytosis showed that an operation was imperative. This then is a clear case where recovery was distinctly and entirely due to early intervention by operation, which was done as a result of the blood-count.

Another important fact which the blood-count shows is in regard to the prognosis after an operation. After the evacuation of a single collection of pus, a diminution in the number of leucocytes is always observed. This is generally pretty rapid; frequently as early as the next, or next day but one, the number of the leucocytes is normal. When, on the other hand, instead of a single collection of pus there are several, of which only one has been opened, then the leucocytosis persists. Curschmann quotes several instances illustrating this point.

It is evident from what has already been said that the blood-count in appendicitis is a valuable aid to diagnosis; it may not be necessary to make a blood-count in all cases, but it should certainly be done in those cases where the symptoms are not quite clear; it is of the greatest service by enlarging our field of vision and so assisting us to arrive at a correct diagnosis.

However, as regards appendicitis at its outset, we quote M. Dieulafoy, who in his clinical lectures, which still hold good and are not in any way affected by the results obtained by the blood-count, comes to the following conclusion, which he thus summarises:—¹ "When peritonitis begins, no one can tell what terrible complications may arise; the mode of onset, the temperature-curve, the appearance on the scene of this or that symptom, only serve to supply us with insufficient or misleading information as to the ultimate condition of the patient."

To sum up what has already been said, the examination for leucocytosis has an importance which is indisputable when the result is *positive*. On the other hand, as has already been said, some cases do occur in which leucocytosis is only slight, notwithstanding the existence of suppuration, and we pointed out under what conditions such a state of affairs could arise. One must not then say definitely that when the examination of the blood gives a *negative* result that there cannot be suppuration; but that does not detract in any way from the

¹ G. Dieulafoy: *Clinique médicale de l'Hôtel-Dieu de Paris* (1896-1897). p. 327.
Paris, 1897.

information when the result is positive. Hayem's sign must not be considered as pathognomonic of appendicitis capable of in itself replacing all other symptoms. It is quite enough that it possesses a utility which has been proved capable, in association with those other symptoms, of yielding valuable information which has been the direct cause, in numerous instances, of operative intervention, followed by the happiest results in cases where the surgeon was in doubt as to the need for surgical interference.



A REVIEW AND STUDY OF SOME RECENT WRITINGS UPON ARTHRITIS AND KINDRED DISORDERS.

By F. J. POYNTON, M.D., F.R.C.P. (LOND.).

Assistant Physician to University College Hospital, and to the Hospital for Sick Children, Great Ormond Street.

INTRODUCTORY.

SINCE the last review of these subjects in the July number of THE PRACTITIONER for 1903 there has been a good deal of writing upon arthritis. The impression given by a general survey of these writings is that the problems of arthritis are gradually becoming less complex ; the blanks in our knowledge are not so much disguised, but are now accepted as blanks to be filled in by further investigation. Let me instance rheumatoid arthritis in explanation. Each year it is becoming more apparent that many different infections will produce a *rheumatoid condition of the joints*. Tuberclse, syphilis, rheumatism, gonorrhœa, and similar infections will all produce this result. Again, the structural changes in the joints such as lipping and grating are now far less relied upon as evidence of a special disease ; and so the aspect of the problem has changed. Is there, we ask now, a peculiar *disease* called rheumatoid arthritis, and if so, how can it be distinguished from a rheumatoid condition of the joints ?

In addition, a more philosophical appreciation of the processes of bacterial infection has tended to make arthritis more simple. We do not so often read of an infection as though it were some rigid process controlled by iron laws ; and it is now more generally admitted that the same infection may produce various classes of lesions. Tubercular arthritis may be acute, sub-acute or chronic ; it may attack the synovial membrane, or the bone. The rigid conception of rheumatic arthritis as a fleeting arthritis dies hardest, and we still read of "pseudo-rheumatic" as a synonym for transitory arthritis. Yet this also will die, and must die, unless we hope to alter the great laws of infection to suit our own opinions.

Another interesting result of the appreciation of the variability in infective processes is the greater caution with which appeals are made to secondary infection. That device has been a very favourite one for explaining away some unusual feature in a case of arthritis. I think this axiom for the scientific study of arthritis is a valuable one :—*The existence of a secondary infection must be proved as conclusively as the existence of the primary infection.* It is almost as great an assumption to explain a phenomenon in disease by the aid of an unproved secondary infection as it is to assume the existence of a primary infection.

Another interesting problem which is now coming to the front is the occurrence of arthritis from the injection of anti-toxic sera. I briefly alluded to this last year. If such sera are proved to be free from bacteria, and if the arthritis is the direct outcome of the injections, then it would appear that arthritis may arise without the deposit of bacteria in the synovial tissues simply from the circulation of poisons—highly complex poisons no doubt—in the blood. This is of much importance ; for, although it is perhaps difficult to picture an arthritis without some local bacterial infection, the philosopher, mindful of gout, will refuse at present to limit his horizon, although he will naturally ask for sure proofs of such an occurrence as arthritis from the injection under the skin or into the veins of fluids that are free from bacteria.

RHEUMATIC FEVER.

Poynton and Paine¹ demonstrated that the diplococcus, which had been isolated from cases of rheumatic fever, was able, in exceptional cases, to produce a non-suppurative iritis in a rabbit, when it was injected into the auricular veins. They also brought forward clinical evidence in favour of the existence of a true rheumatic iritis in man, although this was probably rare.

Shaw² confirmed the occurrence of iritis from intravenous injections of the micrococcus, and in one instance produced a relapse by repeated injections.

¹ "A Contribution to the Study of Rheumatic Iritis." *Trans. Ophthalmological Soc.*, Vol. XXXIII.

² *Journal of Path. and Bact.*, December, 1903.

Philipp¹ has investigated twenty-six cases of acute rheumatism in Pibram's clinique. In twenty-one of these the blood was examined, and in six the synovial fluid. Cultures were made from these upon a number of different media, and inoculations were also made into guinea-pigs, dogs, monkeys, and calves. In not a single case did he get any growth on culture. After injecting the synovial fluid from a case of rheumatic arthritis into a calf, there followed some fever and limping on one hind leg, but there was no swelling of the joints. A fatal case of rheumatic pericarditis and mitral disease gave a negative result. Philipp believes that many of the cases, which have been reported with positive results, are in reality septic in nature. He concludes that in acute rheumatism no microorganisms are present in the blood, which can be demonstrated by ordinary bacteriological methods, or be inoculated with success into guinea-pigs, rabbits, or monkeys. The cause of rheumatic fever, he holds, must still be considered to be unknown.

W. V. Shaw² adds to the evidence which has been accumulated in favour of the infective nature of rheumatic fever, and considerably strengthens the view that there is one bacterial cause—a diplococcus belonging to the streptococcal group of microorganisms. To give his main conclusion first, he is of opinion that the microorganism called by Wasserman the *Streptococcus aus chorea*, by Poynton and Paine the *Diplococcus rheumaticus*, and by Ainley Walker and Beatson the *Micrococcus rheumaticus*, is the actual infective and causal agent of acute rheumatism. This investigation was an experimental one, and, in addition to the confirmatory evidence, Shaw has advanced the whole subject. He has obtained cultures of the organism described by each investigator and shown that these micrococci are one and the same organism. He has also shown that monkeys are susceptible to the infection.

Another interesting fact which he established was the occurrence of endocarditis after a *local* inoculation into the knee-joint of a rabbit. This undoubtedly strengthens the opinion expressed by O'Conor,³ that rheumatic polyarthritis

¹ *Deutsche Arch. f. Klinische Med.*, No. LXXXVI.

² "Acute Rheumatic Fever and its *Aetiology*." *Journal of Path. and Bact.*, December, 1903.

³ *Lancet*, January 24, 1903.

may be a cause of rheumatic endocarditis. The microorganism, in such cases, apparently escapes from the synovial tissues into the blood-stream and thus infects the valve.

Beattie¹ brings forward more evidence in favour of the specific nature of the rheumatic infection. Two cases of fatal rheumatic fever are recorded, and in the second a very complete investigation was made. In both cases the diplococcus was isolated from the joints ; but, owing to a contamination, in the first case no experiments could be made. In the second case a pure culture was obtained, and the lesions of rheumatic fever produced in rabbits. Beattie confirms an important point which has badly needed confirmation. In 1902 Poynton and Paine recorded twitching choreiform movements in a rabbit ; Meyer later observed the same ; and now, independently, Beattie gives a clear account of the same occurrence. It is most interesting that the original culture in this case was obtained from a human knee-joint, and the observation brings us closer to the solution of the problem of arthritis and chorea.

He has also proved, as did Shaw, the important point that the microorganisms injected into the joints may, in animals, be a source of endocarditis.

Poynton² has attempted to reconstruct the skeleton of rheumatism from a study of the morbid anatomy and the clinical course of lesions of rheumatic fever, as observed in man and in animals. The salient points in this argument are :—Rheumatic fever is an infective disease, and, in common with other infections, shows a variability in the character of the lesions which it produces. In spite of this, it is possible, as with other infections, to recognise the usual or cardinal lesions of the disease. These in rheumatic fever are the nodule, the vegetation of endocarditis, the pericarditis, the pleurisy, and the arthritis. Experiment and microscopy have shown that all these lesions are similar in their structure. It is then reasonable to suppose that the cardinal deviations from the usual type of lesion will also be comparable. At the present time investigation has shown that there are two chief deviations in the

¹ Acute Rheumatism caused by the Diplococcus Rheumaticus." *Journal o Path. and Bact.*, 1904.

² Clinical Lectures on Rheumatic Fever." *International Clinics*, Vols. II., III., IV., 1903. Lecture III.—"The Parallelism of the Clinical Symptoms and the Pathological Lesions of Rheumatic Fever," Vol. IV., p. 93.

type of rheumatic lesion, one is a slow smouldering process, as seen in *Mitral stenosis*, the other is an active pernicious process, as seen in *malignant rheumatic endocarditis*. This principle, applied to rheumatic arthritis, suggests the occurrence of a chronic periarticular type, and a destructive type or rheumatic osteo-arthritis. The writer claims that in this way rheumatism can be built up step by step on a basis of accurate facts. He does not accept the view that the salicylates are direct antidotes to *the* rheumatic poison, because it is improbable that there is only one rheumatic poison. For this reason he does not admit that, because an arthritis does not subside under such treatment, the arthritis is necessarily not rheumatic. To apply the criterion of the salicylate treatment to rheumatic arthritis and not to all the rheumatic lesions can only lead to confusion ; and if rheumatic fever is infective, it must be studied as an infective process. But if it is studied as a specific reaction to some particular treatment, then it is only scientific that the *disease*, and not one symptom of the disease—arthritis—should be so studied. To take pieces from both methods of study and to attempt to fit them into one another is, in his opinion, not feasible.

In order to settle the question of the existence of a rheumatic osteo-arthritis he believes it essential to abandon, for a time at any rate, the assumption that the salicylates are a specific for rheumatic fever, and to substitute a study of rheumatic fever as an infective process which produces various types of lesions, as do other infections.

BIO-CHEMICAL STUDIES IN RHEUMATIC FEVER.

Triboulet and Coyon in their book, "*Rheumatisme Articulaire Aigu*," published in 1901, described in some detail the changes produced by the diplococcus of rheumatic fever in various media. In solutions containing 3 per cent. of peptone it produces acetic acid, valerianic acid, and traces of formic acid : in milk it produces lactic and acetic acid : on glucose and lactose, lactic and acetic acid. These authors clearly saw the possible bearing of these observations on clinical medicine.

In the same year Paine and Poynont¹ independently drew

¹ *Trans. Royal Medico-Chir. Soc.*, 1901.

attention to the powerful acid-producing properties of the microorganisms, and suggested that this would eventually throw light upon the long cherished notion that there was some acid-forming process in rheumatism.

Ainley Walker and Ryffel¹ contribute a most interesting addition to this part of the subject. They point out the great haemolytic action of the micrococcus, as they prefer to call the bacterium, and put forward the following provisional statements :—

1. The *Micrococcus rheumaticus* produces formic acid in very considerable quantity, and also at least one other fatty acid.

2. The acid (formic) is present not only in the filtered cultures of the organism, but it can also be extracted from the bodies of the microorganisms themselves. The washed micrococci contain, in addition to formic acid, at least one of the higher acids.

3. Ordinary streptococci, such as a streptococcus isolated from a case of erysipelas, only give rise to a small quantity of formic acid, so far as our experiments at present go. This observation may constitute a means of differentiation between the rheumatic microorganisms and other members of the streptococcus-group.

4. Formic acid and probably another fatty acid are present in the urine during the course of acute rheumatism in appreciable amounts. From normal urine formic acid is either altogether absent or occurs in traces only. (Von Jaksch, *Zeit. für Physiol. Chem.*, 1886, X., 536.)

5. Under the salicylic-acid treatment of rheumatic fever, formic acid is, so far as we have been able to investigate, reduced in quantity in the urine of the patient.

6. Formic acid is obtainable from the tissues of an animal (rabbit) suffering from acute arthritis due to inoculation of the microorganism.

The authors then give in detail the methods of procedure. They remark on the interesting fact that country people believe that bee-keepers are peculiarly insusceptible to rheumatism.

¹ "The Pathology of Acute Rheumatism and allied Conditions." *Brit. Med. Journ.*, September 19, 1903.

This line of investigation in rheumatic fever at the present time is most important; for, as Walker and Ryffel point out, in this way we may be able to discover the rightful position of salicylate of soda in the treatment of rheumatism.

Shaw and Berger have found that the chief acid formed in milk is acetic acid and not formic acid.

CASES OF APPARENT INFECTION IN ACUTE RHEUMATISM.

Thoresen in 1879 was one of the first writers to call attention to apparent infection in acute rheumatism. Mantle, Pel, and Edlefsen also recorded suggestive cases. This subject has been again revived by Turner in a note in the *British Medical Journal*, August 8, 1903; by Le Feuvre also in the *British Medical Journal*, January 30, 1904; and by Sydney Hawthorne in the same journal, December 26, 1903. Each writer gives examples of apparent infection.

THE THERAPEUTIC VALUE OF RHEUMATINE.

This drug is a combination of salicylic acid and quinine. It is sparingly soluble in water, and is without odour or taste. The doses given by Sigel¹ varied from 30 to 90 grains in the day. As a rule 50 grains were sufficient. Sometimes this drug acts admirably, at other times its power to reduce fever is so slight that aspirin must be substituted for it.

Sigel has studied the action of the drug in about 40 cases. It appears to have given rise to no ill-effects except in one case when an urticarial rash appeared. The chief indications for the use of rheumatin are, according to this writer, cases of articular rheumatism in which the heart and kidneys are damaged; cases in which the other preparations of salicylic acid are ill borne; and chronic cases, in order to make a change in the treatment, which, according to Ewald, is a valuable device for bringing out the most satisfactory effects of the treatment with salicylates.

SERUM THERAPEUTICS.

In the review of arthritis last July, the serum recommended by Menzer in the treatment of rheumatism was commented upon, and some of the technical difficulties in the preparation

¹ *Berliner klinische Woch.*, No. 31, 1903.

and use of such sera were considered. Schmidt¹ gives his experience of this method. The commencement of his article is concerned with the present obscurity of the subject of the streptococcal group of organisms, and the difficulties that are met with in the preparation of antistreptococcic sera. Schmidt used Menzer's serum in fifteen cases—three men and twelve women. Eight of these cases were chronic and had resisted all methods of treatment: four cases were more acute in type, and three were sub-acute. The number of injections that were given varied from one to eight, and the particular doses from five to twenty c.c. The dose was cautiously increased, and then when a definite reäction occurred, no fresh injection was made until that had passed off; this sometimes means an interval of two or three days. The injections were made in the neighbourhood of the damaged joints. The reäction differed in the various patients. In seven there was much local reäction, and there were also general disturbances and high fever; in five only local phenomena occurred, and in three no change of any kind. The impression that was given was that the potency of the serum varied much in the different samples. The local reäction was an œdematosus swelling at the site of inoculation, and the skin over this was sometimes reddened. Schmidt never observed the specific reäction in the affected joints which Menzer had emphasised in his original paper. In two cases an urticarial eruption followed the local reäction.

With regard to the results of this treatment, in six out of the fifteen cases, Schmidt thought there was definite improvement. The nature of this improvement was relief from the pain, and a greater ability to use the joint. There was no rapid disappearance of the swelling of the joint. These six cases were four of them sub-acute, and two of them acute. No result was obtained in three chronic cases and one acute one. Schmidt does not advise the use of this serum at present, until all other remedies have failed, and considers its use is chiefly to be expected in the sub-acute cases of rheumatic arthritis.

The failure of Schmidt to detect the specific local reäction in the damaged joints as described by Menzer, is, I think, very important. Much of the writing in Germany on what is called

"Concerning the Treatment of Articular Rheumatism with Menzer's Antistreptococcic Serum," *Berliner Klinische Woch.*, December 7, 1903, No. 49.

acute articular rheumatism, is apparently founded upon a study of the streptococci in the throat. By a process of what I venture to term "short circuiting" the problem of rheumatic fever has been evaded, and the intermediate links in the chain of evidence between the occurrence of streptococci in the throat, and the clinical disease, rheumatic fever, have been disregarded. For this reason I should be surprised to find a constant specific reaction to a serum prepared in accordance with Menzer's view of articular rheumatism.

In a subsequent paper Menzer¹ criticises the statement of Schmidt, that a local reaction of the nature of an oedematous swelling is a common result of the injections with his serum, and points out that the injections should be made well beneath the skin and even into the muscles. Although Schmidt has not observed a local reaction in the affected joints, the author maintains its occurrence and bases his assertion on an experience of nearly 100 cases. Further, he insists on the necessity for many injections; if necessary, 30 or 40.

Menzer believes that his serum will be an important aid, not only in the cases of sub-acute and chronic rheumatism, but also in acute articular rheumatism.

RHEUMATIC FEVER, PYAEMIA, AND MIXED INFECTIONS.

Poynton and Shaw² take up the problem of rheumatic fever and pyaemia and maintain that the view that rheumatic fever is an attenuated pyaemia is founded upon imperfect data. At the best it explains away one difficulty by substituting another and greater one, because pyaemia is not an entity, and attenuation is a word open to great abuse. The authors took the *Staphylococcus aureus*, a frequent cause of pyaemia in man and animals, and showed that it could be distinguished from the diplococcus of rheumatic fever. They then attenuated it by growing it in an acid medium, and attempted to produce rheumatic fever in rabbits and monkeys. In this they failed, producing either septicaemia, pyaemia, or no result at all. In 25 fatal cases of rheumatic fever investigated by Poynton, Paine, and Shaw,

¹ Concerning the Treatment of Acute and Chronic Rheumatism with Anti-streptococcic Serum," *Berliner Klinische Wochenschrift*, January 18, 1904.

² "The *Staphylococcus Aureus* and Rheumatic Fever," *Path. Soc. Trans.*, 1904.

they never found the staphylococcus as a cause. They concluded that the staphylococcus was not a cause of rheumatic fever, nor was rheumatic fever an attenuated staphylococcic pyæmia.

In the second part of the paper they record an investigation with mixed infections. The two bacteria used were the Diplococcus rheumaticus and the Staphylococcus aureus. These were injected into rabbits and monkeys, either simultaneously, or the staphylococcus after the diplococcus. The usual result was pyæmia; and if the animal had already shown signs of rheumatism, the disease altered its type to that of pyæmia. They conclude that in mixed infections the Staphylococcus aureus is not a cause of rheumatic fever.

MUSCULAR RHEUMATISM.

A most interesting contribution to the study of muscular rheumatism is made by Stockman.¹ This writer accepts the view that acute rheumatism is an acute microbic infection. He is however inclined to believe that it never becomes really chronic, and that chronic rheumatism is not a stage of the acute disease. He brings to the study of muscular rheumatism the advantages of a wide clinical experience, and emphasises the importance of the occurrence of fibrous indurations—the result of inflammation. These fibrous nodules are found in the fasciæ of muscles, tendons, and nerves. Under the influence of cold, damp, indigestion, and other causes they become swollen and painful. The most usual situations in which they are to be found are the lumbar aponeurosis, the calves, the fascia lata, the expansions of the muscles of the thigh, the trapezius, deltoid, and inner border of the biceps, the intercostals, glutei, and soles of the feet. Sometimes the fibrous tissue of the neck of the bladder, of the pharynx, behind the sternum, and along the spinal column are also affected. When these nodules swell then follow pain and tenderness. The chief exciting causes of the formation of these nodes are rheumatism, influenza, infections from tonsillitis, local injuries, and exposure to cold and wet. When once the nodes are formed they are liable to swell and cause pain by pressure on nerve filaments.

¹ "The Causes and Treatment of Chronic Rheumatism," *Brit. Med. Journ.*, February, 1904, p. 477.

This subject is elaborated by the same author in a further article.¹

The microscopical examination of the tissues shows cellular infiltration, perivascular exudation and fibrosis ; the indurations may be node-like or form strands. No bacteria were demonstrated in the tissues. With regard to the treatment :—In the acute stage Stockman advises rest in bed, light diet, mild diaphoretics, and mild alkaline diuretics ; and for the pain, salicylates or phenacetin. An attack is sometimes aborted by a hot bath or Turkish bath followed by skilful massage. When the pain, though acute, is localised to a small area, massage followed by passive and active movements are valuable, and the local inunction of methyl salicylate is useful.

For chronic muscular rheumatism the writer strongly recommends skilled massage. This should be especially directed to those places where the nodules are felt ; and to feel them careful palpation should be made with the hand warm and oiled. The first result will be that the nodules become more definite in outline, and at first more painful ; later they shrink. The treatment must be prolonged, and an average time is six to eight weeks. Next to massage comes the use of exercises, which are so devised as to stretch the muscles and aponeuroses. Faradism, though not as successful as massage, has some good effects. Injection of a 1-per-cent. solution of chromic acid in water is sometimes of great assistance in relieving pain, though it is not directly curative. This method can only be used where the nodule is sharply defined. Five to eight drops of the solution are injected from a hypodermic syringe into the middle of the nodule. It is a method which requires care.

Among the drugs that are recommended, grey powder, or some other mercurial preparation, is put first, as valuable when there is intestinal indigestion. In early cases potassium iodide gives relief, and the salicylates ease the acute exacerbations of pain.

In the dieting of such patients, the broad general rule is to avoid gastro-intestinal fermentation by the use of a simple ordinary mixed diet.

¹ "Causes and Treatment of Chronic Rheumatism," *Edinburgh Medical Journal*, February and March, 1904.

Spa treatment is useful in the early cases. The best climate is a dry and stimulating one.

Surgical treatment is indicated when a hard nodule, well-defined in outline, causes excessive pain by pressure upon nerve-filaments. It is essential that these nodules be well defined before an operation is undertaken.

These papers at the present time are of exceptional interest, for the question has often arisen as to the explanation of muscular rheumatism on the assumption that such a condition is a rheumatic process. The theoretical explanation is easy, for, from a consideration of the rheumatic nodule, it is to be expected that a local deposition of the micrococci in any connective tissues would produce cellular infiltration, exudation, perivascular fibrosis and induration. Such a condition would well explain many of the symptoms. It is objected that the pain may come on instantaneously ; yet this would be probable, for the pain in the first place will be the result of muscular movement rather than of the inflammation. The inflamed fasciæ, just as the inflamed pleural surfaces, will cause intense pain when the muscles relax and contract, and thus cause tension and pressure upon these fascial boundaries and their enclosed nerve-filaments. It cannot be claimed that the infection of rheumatic fever can absolutely do this, for no microorganisms have been demonstrated in these tissues. As Dr. Stockman clearly shows, rheumatism need not be the sole cause of such inflammatory lesions ; but whatever their cause the clinical symptoms would be similar. It will be most important to prove whether poisons, either non-bacterial in origin, or if bacterial, not the result of a local infection, can produce such conditions.

CONFUSION IN THE NOMENCLATURE OF RHEUMATIC AFFECTIONS.

The nomenclature of rheumatism and the allied diseases is still in a state of confusion. In the writings which are quoted in this article, this confusion is very apparent.

Rheumatoid arthritis or arthritis deformans is especially complicated. Some writers consider rheumatoid arthritis to be a definite *disease*, the arthritis of which is stubborn, and may or may not implicate the bones and cartilages. Others call this

disease "arthritis deformans," and group the cases into two main classes : in one the bones and cartilages are not damaged, and this is called by them "rheumatoid arthritis"; in the other the bones and cartilages are damaged and this is "osteo-arthritis." Both classes are examples of the disease, arthritis deformans, and both may occur coincidently in the same patient.

Lastly, there are writers who do not use these terms rheumatoid arthritis, osteo-arthritis and arthritis deformans in the sense that they are conditions of a special disease, but express by them the existence of a stubborn and non-suppurative arthritis. In their writings such terms will be met with as syphilitic osteo-arthritis, or tubercular rheumatoid arthritis.

There are evidently two difficulties in this nomenclature, one dependent upon the doubt whether these forms of arthritis are due to one or many causes, and the other a result of an old classification which attempted to put in a special class those cases in which there were changes in the bones and cartilages.

Over gout there is but little difficulty. Rheumatic gout is a term which has fallen into great disfavour; yet if it implies that a patient, who has been and is rheumatic, has also lived a life which entitles him to gout, the expression seems a useful one.

RHEUMATOID ARTHRITIS.

McCrae¹ makes a valuable and detailed report upon 110 cases of arthritis deformans, from which the following points of interest may be summarised here. He holds that rheumatoid arthritis is distinct from acute rheumatism, and give this clinical division.

1. Heberden's nodes.
2. Polyarticular forms.
3. Monarticular forms.
4. Spondylitis.

It is curious that of these 110 cases, 55 were males and 55 were females, and that the proportion of white to black patients was as 26 to 1. In only a small proportion of these was there a history of exposure to cold and damp. In 44 there was a family history of arthritis. The age at which the disease

¹ *Journal of the American Medical Association*, January 2, 9, and 16, 1904.

commenced with the greatest frequency was between 30 and 40. In only 28 was the onset attributed to some definite cause such as mental strain, influenza, &c.

McCrae classifies Heberden's nodes under the osteo-arthritic type of the disease, and finds that they are rarely associated with the more severe arthritic manifestations.

In the polyarticular group there were included 92 cases, and in 41 of these the illness commenced suddenly. He subdivides this large group into the slow progressive type, and the acute type. Among the various symptoms, implication of the cervical spine was frequent, but, as a rule, transitory; and implication of the temporo-maxillary joint was also often observed. The joints most often damaged were the knees. In one case an elbow-joint was opened on the diagnosis of gonorrhœal arthritis, and fibrin was found between the muscular fibres; the synovial membrane was gelatinous in appearance, and the synovial fluid viscid and yellow. Symmetry in the affection of the joints was not remarkable. In 7 out of 74 cases there was organic heart-disease. In 10 out of 83 there were albumen and casts in the urine. In 13 out of 33 there was general glandular enlargement, and in 4 out of 39 the spleen was enlarged. In most of the cases the pulse-rate rose above 90. Subcutaneous fibroid nodules were found more frequently than in acute rheumatism. The reflexes in the regions of the damaged joints were exaggerated.

McCrae emphasises the importance of distinguishing between acute arthritis deformans and acute articular rheumatism, and gives the usual distinctions, viz., the involvement of the cervical spine and the temporo-maxillary and finger-joints, the persistent quick pulse, the absence of cardiac involvement, the muscular atrophy, the failure of salicylate treatment, and the persistence of the lesions.

The last group—spondylitis—is one in which the spinal column is most involved. In some cases the condition is local and in others it is general. This type is osteo-arthritic, but it may be associated with the polyarthritic form in other joints. Twenty-two cases are recorded: twenty in males, two in females.

The usual complaints which were first made by the patients were of crippling weakness, and stiffness of the legs and back,

and pain. In sixteen the onset occurred before the age of 30. The writer insists upon the danger of mistaking cases of spondylitis with only local affection of the spine, for neurasthenia, sciatica, lumbago, or tubercular disease of the spine.

These articles end with the following conclusions :—

1. In arthritis deformans an acute implication of many joints is frequent, and is liable to be mistaken for acute articular rheumatism.

2. It is important to recognise the involvement of the spinal column, and not to overlook those cases in which a small area of the spine is affected.

3. Arthritis deformans is a disease which is not uncommon, and its ætiology is so obscure as to deserve careful investigation.

The pathology of rheumatoid arthritis is carefully discussed, and McCrae inclines to the infective view of the origin of the disease.

It may be recalled that there is sure evidence of the ability of bacteria to produce rheumatoid arthritis. This was stated in THE PRACTITIONER, July, 1903. It is certain that a micrococcus isolated from a case of osteo-arthritis can reproduce these lesions, and it is certain also that the diplococcus of rheumatism can produce rheumatoid lesions.

It seems increasingly probable that many cases of rheumatoid arthritis will prove to be a form of rheumatism, while others are a result of other infections, such as syphilis or tubercle. Whether or not, from among all these, one peculiar condition will be differentiated, which is to be called arthritis deformans or rheumatoid arthritis, is still doubtful.

ARTHRITIS FROM INJECTIONS OF SERUM.

A case of tetanus treated with antitetanic serum, in which recovery occurred, is recorded by Mr. W. F. Annand,¹ the house-physician to Dr. Rose Bradford, under whose care the patient was admitted. The point of interest to the student of arthritis was the following. The patient, a woman, æt. 70, was suffering from tetanus, which probably resulted from the presence of an ulcer on the leg. Antitetanic serum was injected—10 c.c.

¹ *Lancet*, April 2, 1904.

before admission, on November 22nd, 1903; 100 c.c. on the 26th; 90c.c. on the 27th. These injections were made under the skin of the abdomen. Upon December 1st an urticarial eruption appeared with fever, and on December 4th articular pains and swelling of the wrist joints, metacarpo-phalangeal and interphalangeal joints. On the 5th, the knee-joints were swollen. The articulations were tender, and the skin over them red and shiny. This arthritis had disappeared by December 10th.

The occurrence of arthritis from subcutaneous injections of a serum is a most important and interesting fact in the history of arthritis, for it has a close bearing on one of the great problems of the subject. We well understand arthritis from a deposition of microorganisms and a local formation of toxines in the synovial tissues, or as a result of injury, but we know little as yet with confidence of arthritis from the circulation of irritants in the blood.

THE PATHOLOGY OF RHEUMATOID ARTHRITIS.

Erving¹ comments upon the paucity of information upon the blood in rheumatoid arthritis. The most definite fact with regard to it is the occurrence of anaemia, as recorded by Bannatyne and Forsbrooke. Erving, in a series of forty observations, is surprised to find that his experience is different. He finds the red blood-corpuscles above the normal number, and the haemoglobin-percentage also close to the normal mark. To all appearances, in the acute stages of the disease, the formed elements of the blood were unaffected.

Merrins² looks upon osteo-arthritis as a secondary process—a form of chronic inflammation which may follow disease or injury. The causes are classified under three headings:—Infective or toxic, nutritional and traumatic. Merrins does not consider that, because osteo-arthritis occurs in those who have suffered from rheumatism or gout, this necessarily means that one disease has followed another, but holds that the osteo-arthritis is possibly a result of the primary disease from which the patient has never completely recovered. He dwells upon

¹ "On the Condition of the Blood in Rheumatoid Arthritis," *American Medicine*, September 12, 1903.

² "The Pathology and Treatment of Osteo-Arthritis," *Medical Press*, January 23, 1904.

the importance of the internal secretions of various glands in constructive metabolism—for example, of the pituitary body in acromegaly—and also insists upon the importance of injury in senile arthritis. He does not believe there is a purely senile arthritis.

GOUT.

Chalmers Watson¹ upholds the view that gout may be an auto-intoxication or infection from gastro-intestinal tract. In the first part of the paper there is a detailed account of the post-mortem appearances of a condition which Watson believed to be gout naturally acquired in a fowl. The bird after a few days' illness had been found dead, and the post-mortem examination showed deposits of biurate of soda in the extra-articular tissues of the smaller joints; the synovial fluid also contained biurate of sodium. In addition these other lesions were found: widespread thrombosis, notably in the heart and liver; recent pericarditis, and congestion of the liver and kidneys. In the kidneys there were also patches of necrosis. Microscopical examination showed intestinal catarrh, catarrh of the pancreatic ducts, congestion of the spleen, increase in the number of granular leucocytes, and changes in the renal tubules. Watson considered these appearances as characteristic of a bacterial infection, and as thus affording a support to the theory he upheld. The second part of the paper dealt with some clinical and pathological results obtained by dieting fowls on meat and water for periods of three to fifteen months. Finally, the author discusses some of the theoretical considerations of gout, and emphasises the fact that our present knowledge of infections, relapses, and immunity, points to the importance of a bacterial factor in gout, and should direct attention to the by-products of deranged digestion from abnormal bacterial activity in the digestive tract.

Luff,² in the second of two lectures upon chronic diseases of the joints, considers the treatment of chronic gouty affections of the joints.

He writes in praise of guiacum given in cachets containing 5 to 10 grs. Of the alkalies he prefers citrate of potash, which

¹ "Some New Observations on the Pathogenesis of Gout," *Trans. of the British Balsiological and Climatological Society*, 1904.

² *Clinical Journal*, October 14, 1903.

could be used in doses sufficient to make the urine slightly alkaline. He warns against the depressant action of lithium-salts. In gouty hepatic disorders, he advocates the time-honoured blue pill and Epsom salts, and uses as a stomachic a mixture of an alkali with *nux vomica* given before meals. For obstinate arthritis in sub-acute and chronic gout, with oedema and persistent swelling, he advocates massage for a few minutes, followed by galvanism with a current of 5 to 10 milliampères—this also for a few minutes—and then again massage.

SYPHILITIC ARTHRITIS.

Paton¹ classifies the varieties of syphilitic arthritis under two headings : those which occur in the secondary stage, and those which occur in the tertiary.

He subdivides those conditions which occur in the secondary stage as follows :—

- (1) Arthralgia ; (2) Synovitis ; (3) Hydrarthrosis.

1. *Arthralgia*.—This is an intense pain in and around the joints, which is worse at night. It is an early phenomenon in the disease, and may occur without any organic disease of the joint.

2. *Synovitis*.—This is the most common condition. The onset may be sudden, or preceded by malaise. It simulates acute rheumatic synovitis, but the heart is not damaged, and there are no acid sweats.

3. *Hydrarthrosis*.—This almost invariably attacks the knee, and occurs late in the secondary stage ; there is a gradual and painless effusion into the joint. The diagnosis rests partly on the history and partly on the result of treatment.

The forms of arthritis arising in the tertiary stage he subdivides into :—

- (1) Synovitis ; (2) Gummatus arthritis ; (3) Primary disease of the bone and cartilage ; (4) Arthritis secondary to disease in the vicinity of the joint.

1. *Synovitis*.—This usually affects the knee-joint ; there is usually some thickening of the synovial membrane and slight irregular fever. The diagnosis of rheumatoid arthritis may be erroneously made in this condition.

- 2. *Gummatus Arthritis*.—The feature of this is the lumpy

¹ *Brit. Med. Journ.*, 1903, ii., 1389.

thickening of the synovial membrane, the result of gummatous deposits. The amount of exudation varies : the pain varies also in intensity, and is usually more severe at night ; and remissions are frequent. This form is liable to be mistaken for tubercular disease.

3. *Primary Disease of Bone and Cartilage.*—There is thickening of the ends of the bones, ulceration of the cartilage, and thickening of the synovial membrane.

When the arthritis is severe, ankylosis may follow, and this is most liable to occur in the gummatous form of synovitis.

HEREDITARY SYPHILIS.

Paton groups the varieties of arthritis in congenital syphilis thus :—

1. Simple synovial effusion.
2. Arthritis associated with syphilitic epiphysitis.
3. Gummatous synovitis.
4. Osteitis with effusion.
5. Osteitis and gummatous synovitis.
6. Deforming arthritis.

The most common of these forms is simple synovitis which is a more or less painless affection of both knee-joints. A common association with this form of arthritis is interstitial keratitis. When epiphysitis is present it may be very difficult to tell whether the joint itself is really implicated.

Syphilitic deforming arthritis (Fournier) is a result of osteophytic changes and outgrowths at the epiphyiscal line.

Singer¹ gives a brief historical outline of the subject of syphilitic diseases of joints, but considers that the general knowledge upon the subject is as yet imperfect. He contributes five cases which have been under his own observation :—

(1.) The first was the case of a woman aged 40, who was suffering from multiple and painful swellings of the joints, three years after a probable specific infection. The arthritis rapidly yielded to inunctions with mercury.

(2.) The second was also a woman with a chronic deforming arthritis of several joints, especially those of the hands and feet, which had resisted all treatment. Three years before marriage the husband had been treated for syphilis. In this

¹ "Syphilitic Rheumatism," *Wiener Med. Woch.*, March 21, 1903.

case there was marked improvement under treatment with mercury and potassium iodide.

(3.) A woman, aged 58, suffered from a chronic ulcer of the leg which Singer believed to be specific. In this case also many joints were affected. There was ankylosis of the left tarsus and around some of the joints there were bony outgrowths. Treatment with mercury and iodide led to much improvement.

(4.) A man of 43, after an attack of syphilis, suffered great pains at night in the left shoulder-joint, arm, and elbow-joint. There were structural changes in the shoulder and elbow joints. Inunctions of mercury afforded great relief.

(5.) The last was the case of a primipara, who had nodes upon the skull, and myositis and tenosynovitis, in addition to contractures of the elbow-joints and swelling of the metacarpophalangeal joint of the left forefinger. Mercurial inunction produced rapid improvement.

Singer remarks upon the resemblance of these cases under his observation to cases of chronic rheumatism. He emphasises the comparative painlessness, the chronic intractable course, and the absence of severe destructive changes in the joints. Finally he dwells upon the great value of antisyphilitic treatment.

Willannen¹ gives an account of a case of multiple syphilitic arthritis in a man of thirty, which was greatly improved by mercurial treatment.

TUBERCULAR ARTHRITIS.

Since Poncet published his articles on the transitory forms of tubercular arthritis, there has been a good deal of literature upon tubercular disease of the joints, the general bearing of which it may be useful to epitomise. The most common form of tubercular arthritis is the sub-acute form, often called "white swelling." In this, the synovial membrane is thickened and tubercular deposits are found within it, which undergo the usual changes; as the disease advances the cartilages and bones are also implicated; the onset is usually insidious, and one joint, generally a large joint, is affected. In addition to this form, which is looked upon as the type of tubercular

¹ *Die Medicinische Woch. und balneologische Centralzeitung*, September 21, 1903.

arthritis, there are also cases of acute tubercular arthritis of one or many articulations, which may rapidly subside. This is the "tubercular rheumatism" of Poncet and other French writers. Other cases have been described as rheumatoid in type, and are characterised by a chronic course with considerable effusion; these are resistant to treatment, and may or may not be followed by the tubercular deposits in the synovial membrane which occur in white swelling. Again there is a rare tubercular process in the joints which was described by P. Marie under the title "Spondylose Rhizomélique," an exceedingly chronic process implicating the vertebral column and sometimes welding this into a rigid bar ("poker-back"). Lastly, Poncet has described a case of *morbus coxae senilis* of tubercular origin. Thus it would appear that, as with other infective processes, tubercular arthritis varies in type under different circumstances, although there is one type—the white swelling—which must be looked upon as the characteristic process.

The diagnosis of the tubercular nature of an arthritis may be most difficult, and in tuberculosis, just as in rheumatism, there is difficulty in demonstrating the bacillus in the acute arthritis. This difficulty may be so great that even the experimental method of injecting guinea-pigs may fail.

The serum-diagnosis of Arloing and Courmont, dependent upon the agglutination of tubercle-bacilli by the serum of a tuberculous patient, is limited in its use by the probability that there are tubercular lesions elsewhere, and the same applies to the use of the tuberculin-reaction.

The following references give some of the more recent cases of tubercular arthritis that have been published:—

A. Pic and M. Bombes de Villiers: "Spondylose rhizomélique et tuberculose," *Lyon Médical*, October 4, 1903.

Bentz: "Quelques observations de rhumatisme tuberculeux chez les enfants," *La Presse Médical*, August 15, 1903.

Mailland: "Rhumatisme Tuberculeux Primitif," *Gazette des Hôpitaux*, July 23, 1903.

Delore: "Pathogénie de Rheumatisme Tuberculeux," *Lyon Médical*, August, 1903.

Poncet: "Morbus coxae senilis d'origine tuberculeuse," *Gazette des Hôpitaux*, November 24, 1903.

Broca: "Hydrarthroses tuberculeuses du genou," "Arthrites tuberculeuses à forme rheumatoïde," *Gazette des Hôpitaux*, January 28 and February 2, 1904.



A REVIEW OF RECENT NEUROLOGICAL LITERATURE.

By WILFRED HARRIS, M.D., M.R.C.P.,

Physician to Out-Patients, Hospital for Epilepsy and Paralysis, Maida Vale, and Casualty Physician, St. Mary's Hospital.

TABES DORSALIS.

THOUGH the preponderating influence of syphilis in the causation of tabes and of general paralysis is generally acknowledged, yet the precise nature of the initial lesion in each is assuming fresh importance in view of the recent work that has been done on this subject. With regard to the question of the aetiology of tabes and general paralysis in those cases in which neither examination nor the history point to any syphilitic infection, the experiment of Krafft-Ebing is of the greatest interest and importance, pointing as it does to the probability of syphilis being the main factor even in such cases. He picked out nine patients suffering from general paralysis, in whom neither examination, nor the history revealed any evidence of previous syphilis. Each of these patients was then inoculated from 15 to 20 times with material from mucous patches and hard chancres, and each patient, with one exception, was then kept under observation for 148 days ; yet not a single one developed syphilis. This is practically proof that the majority of these nine patients, if not all, had previously suffered from syphilis.

For long it has been taught that the posterior sclerosis in tabes is a degeneration produced by the long-continued action of some circulating toxine, produced in some way by the antecedent syphilis ; and the symmetry of the degeneration has been held as evidence in favour of this theory. Fournier described such lesions as "parasyphilitic" rather than syphilitic, inasmuch as they did not yield to ordinary antisyphilitic remedies. It is accepted that degeneration within the spinal cord, once established, cannot be cured, and the lesions of tabes have been compared with post-diphtheritic neuritis, or

with the nervous phenomena of tetanus, conditions which in no way yield to the specific antitoxines for these diseases, though these antitoxines, when administered in the proper manner, namely, as soon as possible after the period of infection, will destroy, and prevent the development of, bacilli of diphtheria and tetanus, and their toxines. So with tabes to a certain degree the parallel holds good; mercury, and to a less extent potassium iodide, are specific in their action in curing true syphilitic manifestations, whether primary, secondary, or tertiary; yet these drugs have long been discredited in the treatment of the post-syphilitic degenerations, tabes and general paralysis.

If, however, it were to be proved that the tabetic and paralytic degenerations, with which we are all familiar, depended not on a post-syphilitic or parasyphilitic toxine which was not amenable to treatment by mercury and potassium iodide, but on a true syphilitic process, such as a chronic gummatous meningitis affecting the posterior roots especially, and primarily destroying the nerve-fibres in these roots, so that the spinal degenerations are secondary to the destructive process in the posterior roots, caused by the chronic meningitis; then we must at once recast our view that these diseases are parasyphilitic, and not amenable to antisyphilitic treatment. A considerable amount of work has been accomplished by Nageotte during the last 10 years, and more recently by Thomas and Hauser, on the anatomical lesions of tabes. Nageotte¹ comes to the conclusion that the initial lesion in tabes is a chronic syphilitic meningitis which attacks the spinal roots close to the posterior-root ganglion, at the point of emergence of the roots from the sub-arachnoid space. The stress of the lesion falls most on the posterior roots, producing in them a chronic radicular neuritis, which slowly destroys the nerve-fibres, but which leaves the ganglion intact; while the posterior spinal sclerosis is a secondary degeneration to the primary posterior-root lesion. This condition he has found in every one of 11 cases of tabes examined. It is clear, however, that this lesion will not explain all the degenerations of tabes, such as the optic atrophy, and the peripheral-nerve lesions. The latter he explains, as regards the sympathetic and motor

¹ *La Presse Médicale*, December 10, 1902, and January 3, 1903.

nerve-lesions, by the partial involvement of the anterior spinal roots in the radicular neuritis ; while the peripheral degenerations of sensory nerves may be explained by supposing an increased vulnerability of their nerve-fibres after the destruction of the corresponding fibre on the other side of the posterior-root ganglion-cell.

A still further proof of the condition of a syphilitic meningitis existing in tabes is afforded by the results of applying to the cerebro-spinal fluid withdrawn by lumbar puncture, Widal's method of cytodiagnosis. Many observers have now testified to the constancy of the presence of marked lymphocytosis in the fluid obtained by lumbar puncture in cases of tabes, general paralysis, and cerebro-spinal syphilis. Thus Widal, Sicard, and Ravaud¹ found marked lymphocytosis present in 36 out of 37 cases of tabes examined, whereas in other chronic cerebral or spinal diseases lymphocytes, or indeed any cells at all in the fluid, are generally conspicuous by their absence. This condition of lymphocytosis of the cerebro-spinal fluid Nageotte asserts may be the very earliest phenomenon in tabes, and he states that he found it in a patient who afterwards developed tabes, before the pupil-reaction to light was lost ; it was the first definite sign of tabes to develop in this patient. The natural corollary follows upon Nageotte's thesis of the truly syphilitic nature of the initial lesion in tabes, viz., that vigorous anti-syphilitic treatment in the earliest stages of the disease may do much to arrest the development of the radicular neuritis which is slowly destroying the posterior root fibres ; and thus, if the disease be recognised early enough, a satisfactory cure even may be hoped for. More recently, Marie and Guillain² have disputed Nageotte's conclusion that a radicular neuritis is the initial lesion, and they assert that the primary lesion is a chronic syphilitic thickening of the pia mater over the dorsal regions of the cord, producing interference with the posterior lymphatic system of the cord. Whether Nageotte's contention or that of Marie and Guillain be true, does not affect the highly important question as regards treatment. If either be true—if the initial lesion is a radicular neuritis of the posterior roots secondary to a syphilitic

¹ *Revue Neurologique*, 1903, No. 8.

² *Bulletin Médical*, 1903, No. 5.

meningitis, or if there is a chronic syphilitic meningitis affecting the posterior lymphatic system of the cord—the broad basis of treatment will remain the same, namely, energetic anti-syphilitic treatment in the earliest possible stages of the disease, before irreparable damage has been done to the nerve-elements. What has been said of tabes applies with equal force to general paralysis of the insane, in which the anatomical process is practically similar; in one case the stress of the disease falling upon the spinal cord, and in the other the cerebral cortex being mainly affected.

Basing their treatment on this newer view of the pathological anatomy of tabes, several observers have been attempting the cure of tabes and of general paralysis in their early stages by anti-syphilitic remedies. By what is called the intensive mercurial treatment, large doses of mercury are administered hypodermically, in the form of one of its salts—preferably the benzoate, as one of the least irritative to the tissues. It is well known that some forms of syphilitic manifestations are more refractory to treatment than others—for example, some of the cutaneous syphilides—and the lesion affecting the posterior roots in tabes would seem to be one of the most refractory. Yet, by means of this intensive mercurial treatment, under which as much as two-thirds of a grain or more of the drug may be injected daily, Lemoine¹ states that he has seen much benefit to accrue in twelve cases, six of tabes, and six of general paralysis, in some of them practically a cure resulting. Leredde² even more strenuously urges the administration of large doses of mercury in these two diseases, commencing with small doses, and rapidly increasing the dose daily until the maximum is reached, which is continued for several weeks. During this time a strict diet must be insisted on, and a watch kept for gastro-intestinal disturbance; but Leredde states that he has never met with stomatitis in cases under the intensive mercurial treatment. Each patient is made to brush the teeth scrupulously with soap and water after each meal, and to wash the mouth out with water and hydrogen peroxide. Another necessary point to attend to is the weight

¹ See *Lancet*, 1902, Vol. II., p. 690.

² *La Nature Syphilitique et la Curabilité du Tabes et de la Paralysie Générale*, Paris, 1903.

of the patient, which should be taken regularly ; and if serious loss commences, the treatment should be suspended for a time. Iodide of potassium plays only a secondary rôle to mercury in the treatment of most refractory syphilitic lesions, and its use has been shown to be attended by certain dangers in general paralysis, producing as it does a tendency to apoplectiform attacks.

Since it is known that the course of tabes may become spontaneously arrested, and even general paralysis may temporarily remit, it is impossible to argue as to the beneficial results of any treatment from a few cases only ; but with statistics available of a large number so treated, a definite opinion may be arrived at, and Leredde argues that results are already strongly in favour of the remissions of the disease observed being far more than could be accounted for by spontaneous arrest. He argues that the administration of the drug by hypodermic injection is preferable to inunction, because of the accuracy of the dosage, which can never be known when inunction is employed ; and when large doses of mercury are being employed it is important to be able accurately to graduate the dose.

Of paramount importance is the early diagnosis of tabes, if the disease is to be arrested before irreparable damage has been done to the posterior spinal roots. Tabes is a disease which is somewhat protean in its aspect in the early stages, and the first symptoms may be various and easily mistaken for those of gastric disorders, rheumatism, &c. Gastric crises often are a distressing feature in the early stages of the disease, while the knee-jerks and other deep reflexes are still well-marked, and ataxy and even shooting pains in the legs have not yet made their appearance. Indeed, within the last twelve months I have met with two cases in men of about 35, in whom abdominal section was performed, in one case for supposed appendicitis, in the other for carcinoma of the stomach. In both these cases the knee-jerks were brisk, and there was no ataxy, but the clue to the correct diagnosis was afforded by the presence of the Argyll-Robertson pupil, in one of the cases in one eye only. In other cases optic atrophy, or the sudden appearance of Charcot's disease of the knee or hip, or of spontaneous fracture of a long bone, or of troublesome perforating

ulcers, may precede the shooting pains or the appearance of Argyll-Robertson pupil. In cases of doubt help may be obtained by lumbar puncture, and examination of the obtained cerebro-spinal fluid, when the presence of lymphocytosis would decide the diagnosis, since this condition seems to be present only in tuberculous meningitis and in chronic syphilitic processes. As Erb has stated, vague nervous symptoms occurring in a man between 30 and 45, with a history of antecedent syphilis, suggest the possibility of commencing tabes, or general paralysis ; and if the Argyll-Robertson pupil, or analgesia of the legs or trunk, or sphincter-trouble be present, the possibility becomes a probability. If, at this period, energetic mercurial treatment be carried out, before the nerve-fibres in the posterior roots are permanently destroyed, the chances of arresting the progress of the disease, or even the curing of symptoms altogether, are so much the greater.

MYASTHENIA GRAVIS.

Although, as Guthrie pointed out, Willis, of "circle of Willis" fame, apparently described this disease as long ago as 1685, in his book *The London Practice of Physic*, yet the curious disease known as myasthenia gravis, or asthenic bulbar palsy, or simply myasthenia, was until the last four or five years practically unknown in this country, the cases being usually confounded with hysteria. The extraordinary variability of the weakness of the limbs, and bulbar muscles in these cases, generally in young women, in whom rapid or sudden onset of weakness of the limbs, or difficulty in swallowing or in eating supervened on intervals of normal strength, seemed to be characteristic of hysteria ; and it was not until numerous cases had been fully reported in German literature during the previous ten years that the symptom-complex of the new disease became recognised. Briefly, the symptoms are paroxysmal attacks of weakness of the limbs, of the jaw, and of the bulbar muscles, often associated with choking or dyspnœal attacks, nasal regurgitation, bilateral ptosis, external ophthalmoplegia, and often considerable weakness of the facial muscles on both sides. It was Jolly in 1895 who named the disease "myasthenia gravis pseudo-paralytica," and who confirmed Goldflam's most characteristic symptom, the tiring out of the

muscles to a state of complete relaxation, not only by continued voluntary effort, but also by faradisation of the muscles. This temporary loss of contractility of the muscles to faradic excitation he named the "myasthenic reaction." The muscular weakness, often worse towards evening, is unaccompanied by any wasting of the muscles or by any sensory symptoms, and may easily be mistaken for neurasthenia, or hysteria, or disseminated sclerosis. In the last disease paroxysmal attacks of weakness are not uncommon, as are also ocular paralysis, nystagmus, and facial palsy, all of which are common in myasthenia; but the presence of the extensor plantar reflex, or of ankle-clonus, sphincter-trouble, or optic atrophy, with the absence of ptosis and of the myasthenic reaction, should suffice to distinguish disseminated sclerosis from myasthenia. Other conditions to which it bears a certain superficial resemblance are the Landouzy-Déjerine type of myopathy, and chronic bulbar paralysis with involvement of the upper facial muscles, in both of which diseases the appearance may be suggestive of myasthenia, but lacking the ptosis which is rarely absent in the latter disease. This ptosis in myasthenia is almost pathognomonic from its association with a smooth forehead, since paresis of the facial muscles is generally present, whereas the ptosis present in other conditions of paresis of the levator palpebræ, as in tabes, is associated with wrinkling of the forehead from compensatory over-action of the frontalis. The pathology of this disease has for long been a subject for speculation, since, although autopsies have been held upon thirty-two of the fatal cases recorded, no definite and constant lesion of the nervous system has been discovered. Indeed, in the majority, the nerve-cells of the medullary nuclei, the nerves and nerve-endings and the muscles have all been found quite normal, and showing no signs of degeneration. To explain the symptoms, the theory was put forward that the condition was due to a toxæmia in which some toxine, manufactured in the body, and retained in the circulation either from faulty metabolism or deficient excretion, in some way acted on the peripheral nerve-endings or motor end-plates. That this part of the neuron must be affected, and not the muscles themselves, seems to be demonstrated by the myasthenic reaction, in which the muscle, though completely exhausted to voluntary or

faradic stimuli, yet contracts briskly to the galvanic current. It is only recently, since the publication in 1901 by Weigert of the results of his autopsy on Laquer's case, that something definite has been found which may explain the symptoms of this extraordinary disease. Weigert found the medullary nuclei and nerves in this case normal, as had often previously been shown, but there was present a lympho-sarcoma of the thymus gland, with lymphoid infiltration of the muscles. Taken alone, this pathological finding might be considered to be accidental ; but other cases with similar findings at the autopsy have since been brought forward, which seem to prove some causal connection between the morbid process in the thymus and the muscles and the observed symptoms of the disease. Hun¹ gives a careful record of a case of myasthenia with autopsy, in which precisely similar conditions to those described by Weigert were found ; and in an analysis of 114 published cases of myasthenia, with thirty-two autopsies, an enlarged thymus was found in two cases, sarcoma of the thymus in one case besides his own, lympho-sarcoma in the lung or mediastinum in two cases, and lymphoid infiltration of the muscles in three cases besides his own. Hun remarks that the phenomena of the electrical reactions in myasthenia make it evident that the trouble is not in the muscle-fibre, and that the paresis seems to depend upon some alteration in the end-plate of the nerve in the muscle, or upon something which comes between the end-plate and the muscle-fibre. The end-plates were examined in his case, but no lesion was discovered in them ; and he concludes that the cause of the paresis must lie in the lymph bathing the muscle-fibre, and is due to the infiltration of the muscles with lymphoid cells. This condition of the muscles must be of a very chronic nature, because in Goldflam's case lymphoid infiltration was found in the muscles not only after death, but also in a piece of the muscle excised from the patient a year before death. Hun puts the important points in the diagnosis of myasthenia as follows :—(1) a chronic paresis affecting muscles supplied by many motor nerves, both spinal and cranial (ocular and bulbar) ; (2) rapid tiring ; (3) variation in the intensity of the symptoms, and (4) the electrical myasthenic reaction. Of almost equal importance for diagnosis

¹ *Albany Medical Annals*, January, 1904.

are the negative symptoms :—The absence of (1) fibrillation ; (2) of muscular atrophy ; (3) of the electrical reaction of degeneration, and (4) of sensory symptoms. Ptosis is a very constant symptom, occurring in over 80 per cent. of cases ; and almost as frequent are weakness and rapid tiring of the jaw-muscles after eating. Sometimes the voice fails after use, becoming whispering, especially towards evening. Death is often surprisingly sudden, occurring in one of the attacks of dyspnoea or of sudden choking, which usually usher in the terminal event. This dyspnoea, now that we know that we may expect to find disease of the thymus, reminds one of the paroxysmal dyspnoeal attacks sometimes met with in young children, and known as thymic asthma, or *thymustod*, on account of the suddenness with which these children die. This disease has been known for more than a century, and was found in children apparently perfectly healthy until the moment of their seizure with the attack. *Post mortem* the thymus was usually found much enlarged ; and though doubt was for many years thrown upon these cases, through confusion of them with laryngismus stridulus, there seems to be no doubt that thymic asthma is a distinct condition to be reckoned with. Whether these attacks have any relation to the dyspnoeal attacks in myasthenia, which are apparently due to respiratory muscular failure, or whether they are due, as has generally been supposed, to actual pressure exerted by the enlarged thymus upon the trachea, is open to doubt.

Treatment in myasthenia has usually been unavailing, though remissions in the disease are not infrequently seen, the symptoms sometimes clearing up completely. Relapse, however, probably occurs sooner or later ; and some cases have in this manner lived for seventeen years or more, from the first commencement of the symptoms. A few cases seem to have benefited under thyroid treatment, and possibly a new line of treatment may result from the recently proved association of the disease with hypertrophy or lympho-sarcoma of the thymus gland.

ACUTE ASCENDING PARALYSIS.

Under the various terms, acute ascending paralysis, ascending myelitis, and Landry's paralysis, various types have been

described between the most acute inflammatory meningo-myelitis on the one hand and cases in which little or no degeneration could be found in the nerve-cells or fibres of the spinal cord. No doubt, some of the cases under this latter heading were really cases of peripheral neuritis ; but a residuum remains which may fairly be termed Landry's paralysis, in which the clinical features are those of an acute progressive paralysis commencing in the extremities of the limbs, often with certain subjective paræsthesiæ, but without disorder of cutaneous sensation to objective testing, and without involvement of the sphincters. There is no muscular wasting, the deep reflexes are absent, and the case usually progresses to a fatal termination in from two to three weeks, death taking place by respiratory failure. Several authors have in recent years demonstrated in cases of ascending paralysis various microorganisms, some of which produced fatal results when injected into animals ; and recently Farquhar Buzzard,¹ in a typical case of Landry's paralysis, has described a micrococcus which was found in large numbers in the external part of the spinal dura mater, and was also isolated in pure culture from the heart's blood. Subdural injection of cultures of this organism into a rabbit produced after some days a rapidly-spreading paralysis, and the same organism was afterwards recovered from the rabbit's dura mater and from the heart's blood. Cultures of the cerebro-spinal fluid from the man were sterile, and therefore lumbar puncture would presumably be of no diagnostic value in such a case. Dr. Buzzard names the organism "Micrococcus thecalis," on account of its predilection for the spinal dura, but has no theory to suggest for the mode of entry of the organism. If, in similar cases, examination of the dura should confirm the presence of this particular organism, an important advance will have been made in our knowledge of the pathology of a hitherto obscure group of cases.

PROGRESSIVE MUSCULAR ATROPHY.

In two clinical lectures at the Salpêtrière, Raymond² discusses the history of the description of the different types of

¹ *Brain*, Spring, 1903.

² *Gazette des Hôpitaux*, February 5, 1903, and *La Presse Médicale*, January 28, 1903.

progressive muscular atrophy up to recent years, and their separation into two main groups, viz., (1) spinal progressive muscular atrophy, or the type of Aran-Duchenne, and (2) progressive muscular dystrophy, or the myopathies, including the different types of pseudo-hypertrophic muscular paralysis, Erb's juvenile type, and the type of Landouzy-Déjerine. Raymond then discusses the position of transitional cases which appear to link the two main groups together, and predicts that the division set up between these two great groups will disappear sooner or later, and that the various progressive muscular atrophies will be established upon one broad pathological basis. Two transitional types which he refers to are (1) that known in this country as "peroneal atrophy," or the type of Charcot-Marie, which he describes as a sort of hybrid between tabes dorsalis and progressive muscular atrophy, characterised clinically by its commencement often in youth, and affecting several members of the same family; it begins in the small muscles of the feet, next involving the muscles of the legs and then of the hands; it progresses very slowly, and may be accompanied by fibrillary tremors, reaction of degeneration, loss of knee-jerk, ocular paralyses, Argyll-Robertson pupil, ataxy, pains, and anaesthesia. *Post mortem* there is found degeneration of the roots and anterior horns, and of the posterior columns. In some of its aspects this type resembles the myopathies, in its commencement often in childhood, in its tendency to affect several members of the same family, and in its very slow progression, while the lesions found in the anterior-horn cells bring it more into line with the Aran-Duchenne type of progressive muscular atrophy. (2) In another group of juvenile progressive muscular atrophy, the type of Werdnig-Hoffmann, the disease occurs in several members of the same family, and commences in the early months of infancy with weakness of the legs, especially of the thighs, with atrophy of the quadriceps extensor femoris, of the glutei, and of the back-muscles. The atrophy is progressive, involving later the other muscles of the thighs and legs, of the back, neck, and upper extremity. There is no alteration of sensation, and little or no pain, while the sphincters are unaffected. In Werdnig's two cases there was increase of the subcutaneous fat on the dorsum of the feet and later on the legs, and in one of them fibrillary tremors and

bulbar symptoms were present. In these cases there is found atrophy or disappearance of nearly all of the anterior-horn cells from the medulla to the sacral region of the cord, especially in the cervical and lumbar enlargements. The children may live from a few weeks to a few years. Raymond draws attention to the symmetrical distribution of the muscular atrophy ; its appearance in young children ; its familial type, many members of the same family being sometimes affected ; and to the mode of progression of the atrophy, invading the muscles *en masse*, not attacking them singly as in the Aran-Duchenne type of progressive muscular atrophy. Such a case is described by Beevor¹ in which the symptoms were present at birth, the child living only 13 weeks. Three other sisters of this child had also been similarly affected, the symptoms commencing at periods varying from one month to six months after birth. In both Werdnig's cases the symptoms commenced at ten months, and in Hoffmann's cases, four in number, in the second year. Probably under this group should also be included the cases shown by Batten² at the Neurological Society as cases of an infantile type of myopathy, in which the absence of the knee-jerks, wasting and weakness of the quadriceps extensor and of the ilio-psoas, glutei, and back-muscles, certainly recall the type of Werdnig-Hoffman, although in Batten's three cases each child was the only member of the family affected.

Raymond considers that there is no line of demarcation separating the types of progressive muscular atrophy, but that the various types, differing from one another in their clinical aspect and in their ætiology, yet depend on the same pathological basis, a primary degeneration, chronic or progressive, of the lower motor neuron, or of its annexe, the muscular fibre.

FAMILY SPASTIC SPINAL PARALYSIS.

Spiller³ records the examination of two cases of spastic spinal paralysis in a father and son, belonging to a family in which 14 members altogether were or had been similarly

¹ *Brain*, Spring, 1902.

² *Brain*, Spring, 1903, p. 147.

³ *Philadelphia Medical Journal*, June 21, 1902.

affected. The symptoms commenced at the age of five years with weakness of the toes and feet, and spastic gait. There is no anaesthesia and no muscular wasting, while the knee-jerks are much exaggerated, and ankle-clonus and extensor plantar reflex are present. In Strümpell's¹ two cases symmetrical degeneration of the pyramidal tracts was found, traceable upwards as far as the medulla, though in his cases the symptoms commenced much later in life—from 25 to 30. There is no mental impairment in this type, and it is to be distinguished from Little's disease, in which the symptoms of spasticity date from birth, and depend on non-development of the pyramidal tracts.

¹ *Arch. f. Psych.*, Vol. XVII., and *Neurolog. Centralbl.*, 1901, p. 628.



THE SURGERY OF THE GASSERIAN GANGLION.

A REVIEW OF THE METHODS PROPOSED FOR ITS EXCISION
FOR THE RELIEF OF TRIGEMINAL NEURALGIA.

By DONALD ARMOUR, M.B., M.R.C.P. (LOND.), F.R.C.S. (ENG.).

*Assistant Surgeon, West London Hospital; Senior Assistant Surgeon,
Belgrave Hospital for Children.*

SINCE this operation for the relief of trigeminal neuralgia (*tic-douloureux*, *neuralgia quinti major*) was first suggested by Mears in 1884, several methods have been introduced for carrying it out ; while almost every operator has added some modification of his own to the particular method which he has chosen to follow. The result of all the various operations on the branches of the fifth nerve—stretching, simple division, destruction in a bony canal by drill or trephine, excision of a portion—has almost invariably been the same, viz., recurrence of the pain after a longer or shorter interval of relief. In contrast to this stands the complete and permanent relief obtained in those cases in which the ganglion is removed *in toto* by any one of the procedures to be mentioned below. That in all cases of true *tic-douloureux*, in which all three divisions of the trigeminal nerve are affected, surgical measures alone can with any degree of certainty be depended on to afford relief has become a well-established fact. So that it is to be wondered at and regretted that the removal of the Gasserian ganglion should be still regarded as such a hazardous operation in its performance, and as uncertain in its permanent effects. Two reasons can be assigned for such views : in the first place the supposed considerable mortality, and in the second the erroneous impression prevalent regarding the possibility of recurrence of the neuralgia. Concerning the mortality, this has rapidly lessened with increased experience and improved technique, as has been the case in other operations tardily accepted, but now in frequent use. Under the so-called “pterygoid method” the mortality was placed at nearly 30 per cent. Tiffany in 1902 placed it at 22·2 per cent. Cushing

quoted it as at 20 per cent. Murphy and Nepp give 15 per cent.; as does also Hutchinson, who in 1898 collected 92 cases. That this mortality is needlessly high is shown by such results as those obtained by Horsley, who out of 120 cases has had 3 deaths; a mortality of $2\frac{1}{2}$ per cent. The chief factor in keeping up the mortality is largely the exhausted condition of the patients when they come to operation, due to constant pain, loss of rest, inability to take nourishment, and in many cases to the effects of narcotic drugs. Concerning the possibility of the return of pain; such an impression has been occasioned by reports of cases in which incomplete operations have been performed, with subsequent return of pain. Evidence continues to accumulate steadily to show that after the Gasserian ganglion has been completely removed, the neuralgia is once and for all done away with. On this point there is a most instructive case, as yet unreported. In the case of a man operated on by Sir Victor Horsley, it was found impossible to remove the ganglion completely on account of the dense adhesions to surrounding structures; a return of pain occurred. The patient committed suicide, and on careful examination following on the necropsy normal nerve-fibres were found bridging over the gap between the ganglion and the root. In no case in which the ganglion has been removed *in toto* by Horsley has there been any return of pain.

Following upon the unsuccessful efforts to cure trigeminal neuralgia permanently by operations upon one or more branches of the fifth nerve, Horsley undertook in 1886 a large number of dissections to ascertain if it were possible to remove the Gasserian ganglion by operation. He concluded as a result of his observations that while this was possible as regards the lower part of the ganglion, the upper part was too closely adherent and related to the surrounding structures to admit of complete removal, without damaging the latter. Consequently he contented himself with attacking intra-cranially the *divisions* of the nerve, and for this purpose made use of the so-called "pterygoid route" as far back as 1888. Horsley's method of dealing with the divisions of the nerve was extended later on (1890) by Rose to dealing with the ganglion itself.

Heretofore two methods have been introduced with minor modifications; these are the so-called "Pterygoid" or Rose's

operation, and the "temporal" or Hartley-Krause operation. In addition, a return has been made in some quarters to the simple section of the sensory root behind the ganglion, as first practised by Horsley in 1891 in one case, but abandoned by him since then. Reference will be made to these later.

In April 1890 Rose attempted to remove the Gasserian ganglion after having resected the superior maxilla. Approach was had in this way to the foramen rotundum and the second division of the nerve. Nine months later he adopted the Pancoast-Salzer method of approaching the third division of the nerve at its exit from the foramen ovale. Rose then attacked the ganglion by opening the skull through the roof of the pterygoid fossa just outside the foramen ovale taking the third division of the nerve as the guide to the ganglion. The steps to the operation are as follows :—The skin incision commences at the anterior extremity of the zygoma, and follows the upper border of that bone backwards to the ear, where it curves downwards to follow the posterior border of the ascending ramus of the jaw as far as the angle. The flap thus formed is drawn forwards and held or stitched out of the way. The zygoma is drilled, divided at either end of the wound, and together with the masseter turned down. The coronoid process of the lower jaw is then divided, or removed, and with the temporal muscle turned upwards. The internal maxillary artery is ligatured, if possible. Then the external pterygoid muscle is scraped from its attachment to the sphenoid, in order to expose the foramen ovale lying behind the base of the pterygoid processes. The trephine is applied just outside the foramen ovale, and the opening made enlarged with a chisel or bone-forceps. Following the trunk of the third nerve upwards, the sheath of the ganglion is opened, the second division cut through by a sharp cutting-hook, "and the ganglion torn away piecemeal, or, at any rate, broken up."

In 1892 the temporal route for approaching the ganglion was devised independently by Hartley in America and Krause in Germany. This method is now generally known by their combined names as the Hartley-Krause operation. In it the ganglion is approached by trephining the floor of the temporal fossa, and raising up the temporal lobe of the brain together with its dural covering from the basis cranii. In

this way the second and third divisions of the nerve are reached. The steps of the operation are as follows:—A flap having its base at the zygoma and consisting of all the tissues down to the bone, is formed by a horseshoe-shaped incision, commencing in front at the anterior extremity of the zygoma and ending at the posterior extremity of that bone. It reaches up to a point slightly above the level of the top of the pinna. This flap lies over the anterior half of the squamous portion of the temporal bone. If it is intended to sacrifice the bone, a trephine-opening is made, and then enlarged by means of bone-forceps, until an area of bone slightly smaller than the skin-flap is removed. If it is preferred Wagner's osteoplastic method, or some modification of it, may be used for opening the skull. An expeditious way of doing this is as follows:—After turning down the flap consisting of all the structures down to the bone, as described above, a trephine-opening is made in the hinder part of the bone thus exposed. Through this the dura mater is stripped carefully off the under surface of the bone to be turned down. Then by means of a chisel and hammer or a skull-saw the bone-flap is marked out above and in front and behind by grooves running from the trephine-opening. By means of large bone-forceps, used through this opening, the bone flap is cracked up and turned downwards, having its attachment along a line parallel with the zygoma and base of the skin-flap. The temporal lobe, together with its dura mater, is now lifted upwards from the base of the middle fossa of the skull by means of a retractor. By this proceeding the foramen ovale and the foramen rotundum are brought into view, lying directly inwards at a depth of about 3 cm. or $1\frac{1}{4}$ inches from the well of the temporal fossa. The inferior division of the nerve passing through the foramen ovale is then clearly defined. The middle meningeal artery passing through the foramen spinosum lies just behind and slightly to the outer side of it. As a rule this artery gives no trouble, nor is it usually necessary to divide it. The dural covering in which the ganglion lies (*cavum Meckelii*) is then opened along its lower border by means of a small sharp scalpel. By means of a blunt dissector the dural covering is stripped off the ganglion, beginning at its lower border, until the second and third divisions are clearly defined. The upper border is then

defined in the same way, but as a rule presents greater difficulties. The third division is then cut through at its exit through the foramen ovale; then the second at the foramen rotundum; and finally the superior division is cut across close to the ganglion, or even the corner of the ganglion cut through into which it is passing. The ganglion thus freed all around—especial care being paid to its deep surface—is seized, and by steady traction the root is drawn out from the pons.

In 1895, Doyen published a method of operating by the temporal route, the steps of which are as follows:—A sickle-shaped incision is made through the soft parts over the temporal region. Commencing just above the pinna, it curves forwards following the line of the temporal ridge; then curving downwards, it turns backwards above and parallel with the zygoma to a point just in front of the ear, where it takes a vertical direction downwards for 5—6 cm. (2—2½ inches); this last portion, representing the handle of the sickle, should not pass more than 15 mm. below the zygoma. The zygoma is resected, the coronoid process divided and together with the temporal muscle turned upwards, thus denuding the temporal fossa. The inferior dental and lingual branches of the third division of the nerve are then identified and divided, the cut ends being seized by forceps. The internal maxillary artery is ligatured close to its origin. The skull is then opened by a trephine at the level of the spheno-temporal suture. By means of bone-forceps the great wing of the sphenoid and the squamous portion of the temporal bones are removed over the area of the lower portion of the temporal fossa, exposed by the previous resection of the zygoma. As soon as the bone is removed down to the infra-temporal crest, the base is attacked, and the bone removed into the foramen ovale. The forceps attached to the inferior dental and lingual nerves are then lifted up and by their means the inferior maxillary trunk is raised and the cavum Meckelii opened from the outer side. Traction is then made upon the ganglion itself, and its anterior and posterior aspects are exposed and freed. The superior maxillary nerve is then freed up to the foramen rotundum, where it is divided; and the ophthalmic division is cut at the sphenoidal fissure. The entire ganglion is then freed back to the superior border of the petrous bone, i.e., to where the root

passes in a sheath of dura mater beneath the superior petrosal sinus. The root is then isolated and divided upon the posterior aspect of the petrous bone beneath the venous sinus.

Rose, in *THE PRACTITIONER*, May 1902, describes a case of removal of the Gasserian ganglion by Doyen's method which he modified in some details; and expresses himself satisfied with it. His modifications appear to have been the division of the zygoma as far back and as far forwards as possible, with provision for subsequent wiring; the complete removal of the coronoid process and the temporal muscle; the isolation of the inferior division at the foramen ovale after the bone is removed, no attention being paid to identification of the inferior dental and lingual nerves. Nor did he remove quite as much bone as Doyen. Rose does not think there is much to choose between Doyen's incision and his own, and concludes by preferring his own, if placed a little higher than usual.

In 1900, Cushing, of Johns Hopkins Hospital, read a paper on a method of removal of the Gasserian ganglion "by a route through the temporal fossa and beneath the middle meningeal artery." He uses a horseshoe-shaped incision in the temporal region with its base corresponding to the zygomatic arch. He describes the incision as much lower and considerably smaller than that adopted in the Hartley-Krause method. A skin-flap is turned downwards "until the underlying temporal fascia is exposed well up to its attachments to the zygomatic arch and the posterior or temporal border of the malar bone. An incision is then made through the temporal fascia, concentric with and just inside of the skin-incision; and at the base of the skin-flap it is carried along the middle of the outer surface of the zygomatic arch through the periosteum down to the bone." The periosteum is elevated, leaving the attachment of the masseter muscle uninjured, and the zygoma is resected. The temporal muscle is then incised concentrically with the skin-incision; and the muscle is scraped away from the temporal fossa, and together with the zygoma is retracted downwards. The lower part of the temporal fossa as far down as the external pterygoid muscle is thus bared. A small opening is then made by a trephine or mallet and gouge through the most prominent part of the great wing of the sphenoid; and this opening is enlarged downwards to and including the

infra-temporal crest. The dura covering the temporal lobe, with the exposed middle meningeal artery, is then lifted from the base of the middle fossa until the dural attachment at the foramen ovale is reached. The dural envelope surrounding the ganglion is then opened in a line from the foramen rotundum to the foramen ovale, and by blunt dissection the upper surface of the ganglion is exposed well back to the sensory root. Cushing lays stress upon the importance of *not* elevating the ganglion during this last manœuvre, in order to avoid haemorrhage. The ganglion and the second and third divisions are first freed, and then the superior and internal edge of the root, and the first division, are attacked. The ganglion is next seized by a pair of forceps just at its posterior part, and the three divisions are divided in turn close to their foramina. The sensory root is then evulsed by means of the previously-attached pair of forceps. Cushing claims for this method, which is obviously a compromise between the pterygoid and the temporal routes, certain advantages over the Hartley-Krause method, which he calls "the high temporal route." He thus describes the advantages claimed for his modification:—"It makes use of the paramount advantage of the Hartley-Krause operation, namely, that of exposure of the ganglion by the temporal route. The trephine opening through the fossa temporalis, however, is sufficiently low, so that the extra-dural manipulations may be conducted *underneath the arch made by the middle meningeal vessel*, which is retracted with the dura and yet remains uninjured at its two fixed points, namely, at the foramen spinosum of the temporal bone and at the sulcus arteriosus of the parietal. Under this arch with but slight elevation of the temporal lobe the entire ganglion and its sensory root may be exposed. The method may be said to give the maximum of exposure with the minimum of cerebral compression and injury of blood-vessels."

In some quarters there is a disposition to return to the simple section of the sensory root of the fifth nerve without removal of the ganglion. This method was first practised by Horsley in 1891. He trephined the temporal fossa, opened the dura, and by lifting up the temporal lobe was able to cut the roots of the fifth nerve just below the pons. Although this is constantly referred to in the literature as if it were still

practised by Horsley, as a matter of fact he only did the one case in this way, and has never reverted to it. He now uses the Hartley-Krause method with modifications as to detail.

The operation depends for its immediate success upon the complete division of the sensory root of the ganglion and for its permanent success upon the inability of this root to undergo regeneration. Into the discussion of this latter question I do not intend to enter in this review. It is obvious, of course, that section of the sensory root as a surgical procedure is simpler than removal of the entire ganglion. But the objections raised by the exponents of the root-section method against the removal of the ganglion are not such as will intimidate the surgeon of tried skill, experience, and ready resource.

There has been suggested by Ramonède another method of approaching the sensory root which he calls the "occipital, or retro-mastoid" route. He proposes by this means to reach the root at a point between the ganglion and the pons. An incision, which includes the soft parts down to the periosteum, commences 1 cm. above the tip of the mastoid process and in the centre of its cutaneous surface, and passes upwards just behind the commencement of the temporal ridge. Curving backwards it reaches its highest point 3 cm. above the superior

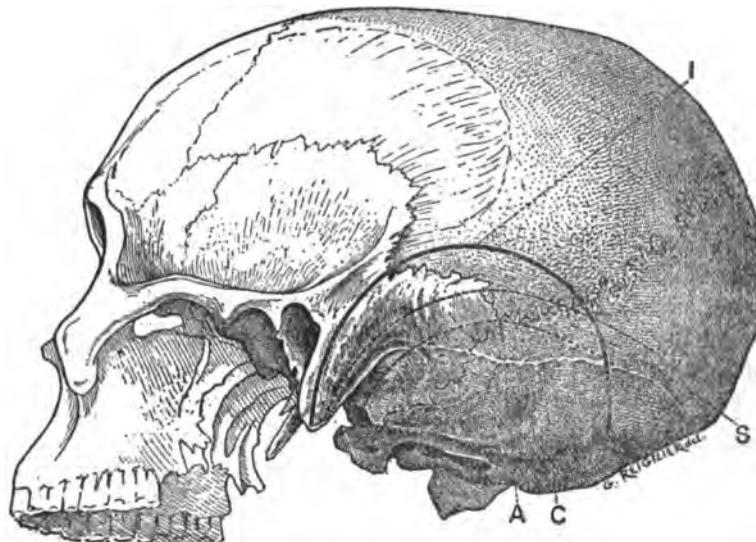


Fig. 1.

curved line of the occipital bone and then passes downwards, following a similar line as before, at a distance of about 4 cm. from the external occipital protuberance (Fig. 1). A flap of periosteum is then turned down. The posterior border of the mastoid process and the asterion are thus laid bare. An opening in the skull is made, reaching upwards 1 cm. above the asterion, and in front nearly to the mastoid process, but not touching it. The dura mater over the cerebellum is thus reached, and in the upper and anterior part of the opening is seen the lateral sinus (Fig. 2). A semicircular incision is made

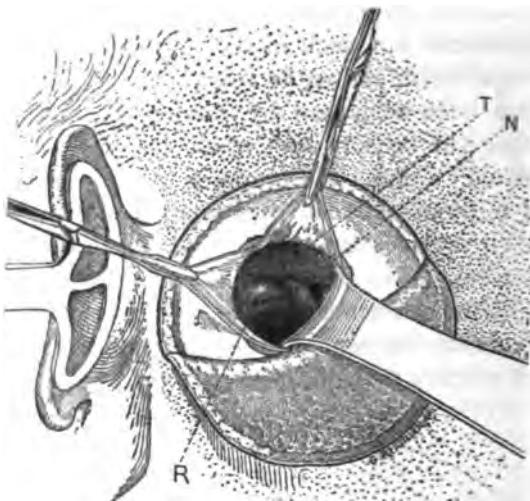


Fig. 2.

in the bend of the sinus, and a short distance from it. A retractor then is used to press back the cerebellum in front and a way is opened between it and the petrous bone. The root of the fifth nerve is thus reached at the apex of the petrous bone, avoiding in so doing the seventh and eighth nerves lying below and at a lesser depth. The nerve is isolated by means of a blunt hook, care being taken to avoid wounding the sixth nerve lying a little beyond it, and is cut through. The peripheral end is then seized by very fine forceps and torn away.



A CASE WITH COMMENTS.

ACUTE NECROSIS OF THE LINING MEMBRANE OF THE URINARY BLADDER.

By C. W. DEAN, F.R.C.S. (EDIN.).

Honorary Surgeon, Royal Lancaster Infirmary.

[With Plates XXII., XXIII.]

A RECORD of the following case presents several points of interest, not the least being the fact that, although the subject of it has practically no bladder, a mere slit representing all that remains of this organ, he is alive and perfectly well.

Mr. S. G. Shattock, Pathological Curator of the Museum of the Royal College of Surgeons of England, and Dr. David Waterston, late Curator of the Museum of the Royal College of Surgeons of Edinburgh, have been most kind in answering my enquiries as to specimens exhibiting similar conditions in the museums under their charge.

Mr. Shattock says :—" There are five such specimens in the museum of the College. Some of these are of the mucous coat, with varying amounts of the muscular, and one was removed by suprapubic cystotomy from a male."

Dr. Waterston says :—" We have several specimens illustrative of a similar condition of the bladder ; one belonging to the Bell Collection shows a sloughy, shreddy condition of the lining of the bladder, seeming to be represented by the muscular and submucous coats. In this specimen the condition has not penetrated as deeply as in your case."

In none of the above cases do we know whether the patient lived or died ; but I think it is safe to assume that with the exception of the cast removed by suprapubic cystotomy, mentioned by Mr. Shattock, most of the specimens would have been obtained after death.

In the text-book of White and Martin, I find it stated that the majority of reported cases of mucous casts of the bladder have occurred in women. In one of the cases reported by

Stein, the shreds involved both the mucosa and submucosa. Cabot found in one case, on which he performed suprapubic cystotomy, a thick membrane composed almost entirely of epithelium, which seemed to be nourished by papillæ thrown out from the connective tissue ; and this membrane, he stated, could be easily peeled off the diseased surface of the bladder.

Adami says :—“These casts are usually composed largely of fibrin, the layers of the bladder wall being incorporated in it, even some of the muscular tissue.” He considers such a condition to be practically a necrosis of the inner layers of the bladder.

My own case, which seems to come under this heading, has the following clinical history :—

The patient is a young man, 18 years old, of debilitated constitution and poor physique, who probably (but definite information is unattainable) suffered from bladder-trouble in infancy. There is also an indefinite history of calculus in the family.

From the age of 7 to 14 he was in an orphanage, and enjoyed comparatively good health. On leaving the orphanage he slept in the same bed as his brother, who states “that his (the patient's) water used to stop” and “that he had difficulty in passing it,” and that “he frequently had to get up during the night to micturate.”

His present illness began on August 15, 1903, when, while out hawking with his mother, he complained of being unable to pass water. His mother gave him a dose of gin, but as this did not relieve him, they returned home. He remained in great pain from that evening (a Saturday) until the following Monday morning, when he was admitted into the Lancaster Infirmary. A soft catheter was at once passed, but only to a distance of 2 inches from the meatus, when it became fixed and could neither be withdrawn nor passed on. As the instrument could not be removed without breaking it, and as I concluded the cause of its fixation to be a calculus, I cut down on the urethra and, with some difficulty, removed a phosphatic stone. The catheter was then passed into the bladder, but, beyond a few drops, no urine was voided. The patient, however, was relieved, and the pain ceased.

The next morning, as no urine had come away beyond a

PLATE XXII.



Fig. 1. Showing the macroscopic appearance of the cast of the bladder (outer surface).

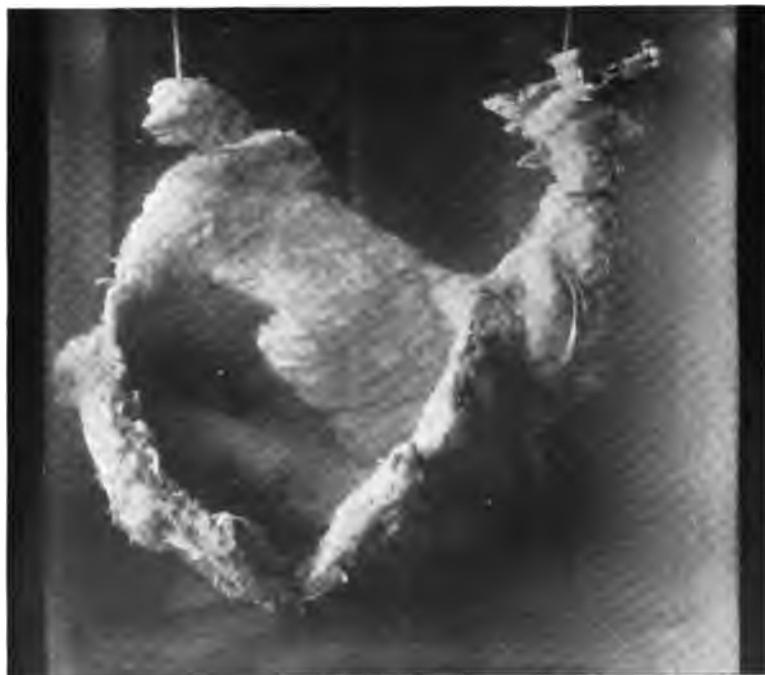


Fig. 2. Showing the macroscopic appearance of the cast of the bladder (inner surface).

PLATE XXIII.

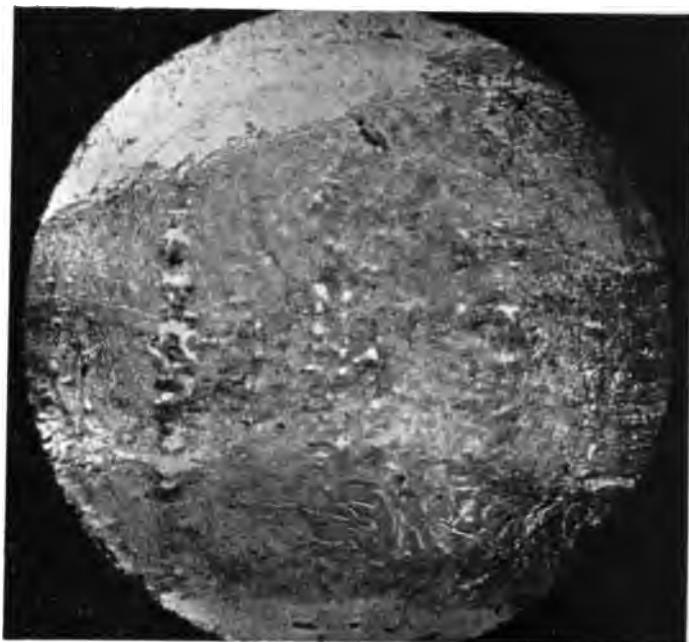


Fig. 3. *Section through cast of bladder, showing mucous, submucous, and muscular layers. (Microphotograph.)*

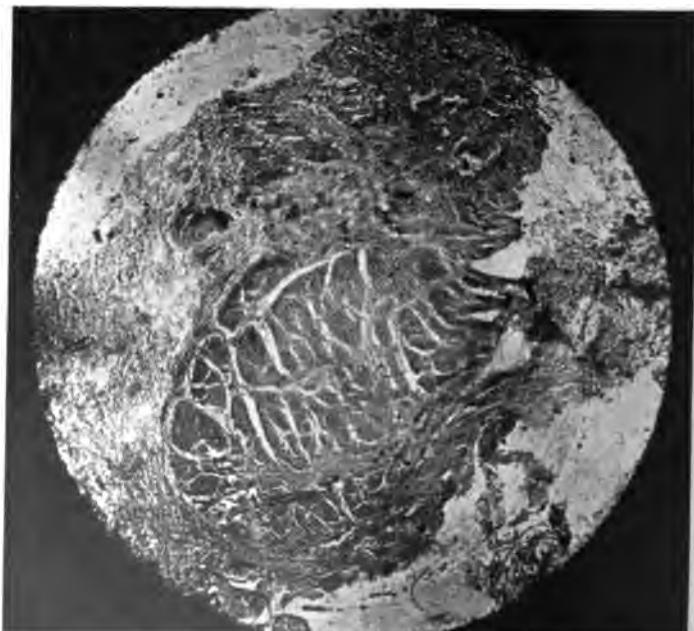


Fig. 4. *Section through cast of bladder, showing principally the muscular layers.*

few drops, another attempt was made with the catheter, but with no result, although the bladder-dulness was well marked. I then aspirated above the pubes, but hardly any urine came away ; the patient, however, expressed himself as much relieved, and hot fomentations materially added to his comfort.

The next day a little water came away, and on the following day the large quantity of 95 ozs. was evacuated.

From this date (August 20) his temperature began to rise, and although he now passed varying amounts of water, from 50 to 26 ozs., daily, he was undoubtedly suffering from septic intoxication.

On September 3, as the amount of water passed had dropped to 3 ozs., I performed suprapubic cystotomy, and removed the cast, which presented the appearances seen in the accompanying photographs. The patient began to recover immediately, and the temperature soon became normal.

The condition of the interior of the bladder some weeks ago, before the suprapubic wound closed, was curious. The sac would barely admit two fingers, introduced vertically, and rapidly narrowed towards the urethral orifice to form a sort of triangle. The walls were smooth, rigid, and non-contractile. The orifices of the ureters were patent, and the urine was, and is now, freely secreted ; and since the abdominal wound closed, it continually runs away through the urethra. The patient is in good health and gets about comfortably, wearing a portable urinal.

Reviewing the severity of the initial symptoms, I think the necrotic process must have begun before the removal of the urethral stone, and I am strongly of opinion that somehow the *Bacillus coli* is the "*fons et origo*" of this man's trouble.

Mr. Eastes, who kindly examined the specimen for me, lays stress on the presence of streptococci, but these may have been introduced at a later stage. I append his report, in which he draws attention to the rarity of such specimens, and this, along with the photographs, will go far to make the severity of the condition understood.

Mr. Eastes says :—"This portion of membrane from the bladder consists of necrosed vesical mucosa, submucosa and musculature. Almost the entire thickness of the bladder has sloughed away, due to an extreme toxic action on the part of

infective organisms. These are of two or three kinds, but the most numerous are streptococci. The invasion appears to have been from within the bladder, as the rotten, decomposed mucosa and submucosa are thickly crowded with cocci, which gradually become scarcer towards the muscular coats, though still fairly numerous. This condition of wholesale necrosis of the bladder is extremely rare."

Postscript.—Since writing this report I have again had the patient under observation. Within the last few weeks the sphincter vesica seems to have regained some power, and the bladder can now retain as much as five ounces of urine at a time, the patient knowing when he wishes to pass it, and being able to do so in a natural manner.

This is distinctly interesting, as in the earlier stages of the case the bladder was a mere cleft, and it seemed much more likely that it would cicatrise completely than that it would again dilate and become a useful organ.



Public Health.

THE PURITY OF FOOD AND DRINK.

By LOUIS PARKES, M.D., D.P.H.,

*Medical Officer of Health for Chelsea, and Consulting Sanitary Adviser to
H.M. Office of Works.*

THE final report of the Royal Commission appointed to enquire into arsenical poisoning from the consumption of beer and other articles of food or drink, draws attention in a very marked manner to the chief defect in our present system of protecting the public from fraud, adulteration, and dangers to health in matters of food and drink. In this system a large number of individual sanitary authorities are exercising the powers conferred on them by the various Sale of Food and Drugs Acts, each district setting up its own standards, defining the limits of its legal actions, and generally being a law unto itself; whilst there is no central body to harmonise and coördinate the efforts of the various district bodies, to exercise a general administrative control, or to supervise generally the purity of foods from a national, as apart from a local, point of view. The Local Government Board is at present the Government Department mainly charged with supervising the administration of the Sale of Food and Drugs Acts, but the Board has no expert advisers on food-questions; it has in consequence no sort of Intelligence Department, and is thus content with the comparatively humble task of collating and tabulating the quarterly reports of the Public Analysts throughout the country which are by law required to be sent to the Board.

In matters of public health, especially in relation to epidemic diseases, the Local Government Board has expert advice from its Medical Officer, who relies upon the reports of a highly-trained staff of medical inspectors. The country has every reason to regard this arrangement with satisfaction. The Board's medical staff acts the part of the Intelligence Department of the War Office; it acquires the information by which

the avenues of approach of cholera, plague, small-pox, and enteric fever are ascertained in advance of the event ; it coördinates the arrangements made by local sanitary authorities for controlling epidemic invasions, should they occur ; and it maintains at all times the sanitary defences of the country in that state of preparedness that an enlightened public opinion demands. The local medical officer of health can look for light and guidance in any matter affecting the health-interests of the community he serves to the Local Government Board and its medical department ; and the latter having constantly in view the general health of the country, is often in a position to advise and assist to the best purpose the local authority, which naturally has a more limited outlook.

The position of the local public analyst is altogether different. He is, as a rule, appointed and paid to make each year a certain number of analyses of samples, submitted to him by an officer appointed by the sanitary authority for the purpose of taking samples. He probably has some choice as to the nature of the samples to be submitted to him, but he does not advise his authority on general questions of the purity of food, and his main function is, as already stated, merely to analyse and report upon the samples sent him. He is not called upon to form any opinion as to the possibilities of adulteration or of injurious ingredients being contained in new foods and drinks placed on the market, or in novel methods of manufacture of foods and drinks already in use. There is no one to advise him on the subject, and he has no means of knowing what is taking place in the manufacturing world, as he can hardly be expected to have an expert knowledge of every process of food- or drink-manufacture.

The result of this want of system is made very clear by the Report of the Royal Commission on the epidemic of arsenical poisoning in 1900 in Manchester, Salford, Liverpool, and other northern cities. The poisoning, which affected at least 6,000 people, and probably many more whose cases were never traced, was due to the supply of arsenical sulphuric acid by chemical manufacturers at Leeds to a firm at Garston, near Liverpool, who used it in the manufacture of glucose or invert sugar for brewing purposes. The presence of arsenic in the beer was not discovered by any public analyst or by the Inland

Revenue officials until after attention had been drawn to the possibility of such contamination by the medical officer of one of the infirmaries where the patients suffering from arsenical poisoning were being treated. The Royal Commission has drawn attention to the possibility of beer being also contaminated by arsenic from the use of malt dried over gas-coke, and to various other articles of food, drink, and drugs, which might conceivably receive small additions of arsenic as the result of the processes of manufacture now commonly in use. In fact the Royal Commission has been acting for a time as the Intelligence Department of the Local Government Board in respect of the possibilities of arsenical adulteration. But when the Royal Commission is dissolved, its functions are at an end, and there will be no further intelligence as to what may next be expected in the way of insidious poisoning of the population by articles of food or drink.

What is evidently required is that the Local Government Board should have expert advice and assistance from a person not only skilled in methods of analysis, but having expert knowledge of the various manufacturing processes in use in the preparation of food and drink. Like the medical officer, the chief food officer should have at his disposal a staff of inspectors to make the necessary enquiries as to the conditions of manufacture of food and drink throughout the country, and a staff of analysts to carry out the necessary investigations. With such expert advice the Local Government Board could undertake to control and regulate the administration of the Sale of Food and Drugs Acts by the various sanitary authorities throughout the country, levelling the more inert districts up to some such standard of efficiency as might be indicated by the report of a travelling inspector after local enquiry.

If any advance is to be made in this direction of a more uniform efficiency in the various areas of administration, it will be necessary for the Local Government Board to prescribe "standards for the purposes of the Sale of Food and Drugs Acts," as recommended by the Royal Commission, and as has already been done by the Board of Agriculture under powers conferred by the Act of 1899 in respect of milk, and as may be done in respect also of butter, cream, and cheese. These standards would not, of course, be models of purity for

manufacturers to aim at, but their object would be to afford satisfactory means of judging whether in a given substance there had been substantial failure to secure purity. After investigation by the chief food-officer, the Local Government Board would be in a position to prescribe standards which would be of especial advantage, (1) in respect of substances used in the preparation of food, such as sulphuric acid, glucose, malt, and colouring matters, and (2) in respect of the presence in foods of preservatives. These standards should be made obligatory by public analysts in certifying adulteration under the Sale of Foods and Drugs Acts ; and as a result, to a very large extent that uniformity in practice would be obtained that is now so conspicuously absent. Under existing conditions this want of uniformity leads sometimes to an article of food or drink being sold with impunity in one district, whilst in an adjoining district the taking of a sample of the same substance leads to a prosecution and the infliction of penalties.

The most important function, however, of the expert food officer to the Local Government Board would be his general supervision over the whole business of food-production in this country, and his knowledge of the nature and constitution of the food and drink imported into the country from abroad. His annual reports to the Board would guide each local public analyst as to where to look for adulteration and how to cope with it ; and in cases of emergency the central office would be consulted on all those aspects of a case which are often involved in obscurity by reason of want of knowledge of the circumstances appertaining to the case outside the local area. It is only by such means, involving as they do a certain amount of familiarity with all classes of current food- and drink-manufacture, and of the constitution of imported products, that public analysts can be kept posted up as to the requirements of their districts, and that such disasters as the epidemic of arsenical poisoning of 1900 can be avoided in future. So much capital and energy are already devoted to the preparation of various foods and drinks, and so much inventive genius is constantly being brought to bear upon the preparation of new foods and drinks by novel methods, that the interests of the public are very largely concerned in the adoption of some

system by which there shall be Government supervision under skilled officers of all kinds of food and drink placed upon the market.

The subject of "clean milk" is very intimately connected with the question of preservatives. Milk which is not clean—which has been obtained from dirty cows with soiled udders, by unwashed milkers, from filthy cowsheds—can be placed upon the market hundreds of miles from its place of origin, if boric acid or some other preservative be added to the milk prior to despatch from the farm. Hitherto the greatest difficulty has been experienced in getting the small farmers and the cow-keepers in the more remote districts to realise that the old-fashioned insanitary methods of producing milk are no longer allowable. On the large dairy farms owned by the joint-stock companies, cleanliness in handling the milk is probably now more often the rule than the exception; but it is far otherwise with the small producers. The farmers themselves are unwilling to make alterations, of the necessity of which they are little convinced; and the farming interest often controls the local boards of guardians, who are the rural sanitary authorities; consequently no sanitary inspections are made of the cowsheds, and the "Cowsheds, Dairies, and Milkshops Regulations" are unenforced.

If the use of any kind of preservative whatever in milk was prohibited, as recommended by the Departmental Committee on Preservatives and Colouring Matters in Food, the farmer who sends milk by rail to market would be compelled, in order to protect his milk from fermentative changes, to study cleanliness in his methods of collecting and storing it, and to adopt all those processes of refrigeration and cold storage which are so essential for the prevention of bacterial multiplication. The town retailer would be equally prohibited from the use of preservatives, and would in consequence not only himself take effectual steps for the sanitary handling of the milk consigned to him, but would also insist on the supply reaching him in a sound condition. Apart from any question of the deleterious action on the consumer of boric acid or other preservative in milk, the adoption of the recommendation of the Departmental Committee prohibiting the use of preservatives in milk would have more effect in promoting cleanly methods on country

dairy-farms than any system of compulsory enforcement of the Cowsheds, Dairies, and Milkshops Regulations by rural sanitary authorities, or sanitary inspection of country dairy-farms by officers of urban sanitary authorities. Such systems would be very costly, and would excite much local opposition; whereas the prohibition of the use of preservatives could be enforced with little difficulty, and would tend automatically to bring about the desired result. The somewhat doubtful experiment of municipal milk-depôts for the supply of sterilised milk, altered or adapted to the supposed needs of the human infant—with the attendant possibilities of the production of scurvy and rickets if not safeguarded by adequate control and supervision—would be rendered unnecessary, if some general guarantee for the cleanliness of the milk imported into the great centres of population were forthcoming. The prohibition of preservatives in milk would be the first step towards the attainment of this guarantee. Other measures would follow.

Under the existing Sale of Food and Drugs Acts in any prosecution, if the defendant prove that he had purchased the article as the same in nature, substance, and quality as that demanded by the prosecutor, and with a written warranty to that effect, that he had no reason to disbelieve the warranty, and that he sold the article in the same state as when he purchased it, he is not guilty, and the prosecution fails. In the milk-trade, warranties are now very largely given, both by the farmer to the wholesale or retail dealer, and by the wholesale to the retail dealer. The warranty is held to be the agreement entered into when the farmer or wholesale dealer contracts to supply the retailer. The agreement is often made for a year; but no proceedings are valid against the warrantor after six months from the date when the warranty was given. Consequently, although the Act of 1899 authorises proceedings against a warrantor for giving a false warranty, the latter is practically exempted from the operation of the Act during the second half of the year for which he has contracted to supply the consignee. It sometimes happens also that the inculpated milk has passed through more than two hands, namely, the farmer, the middleman, and the retailer, and each of the last two is protected by a warranty. Three separate sets of proceedings are then necessary before the original warrantor can

be reached ; and even then the case fails, if this party proves that when he gave the warranty he had reason to believe that it was true.

The system of defence under warranties is very seriously weakening the powers of local authorities in safeguarding the public from adulterated milk ; and it is becoming more and more evident that nothing less than the total abolition of the warranty clauses from the Acts will be effectual in restoring those powers to check adulteration which the Acts were intended to convey. The public protection can only be secured by rendering the actual seller to the public liable for what he sells. If the retailer is protected by a warranty, he should be able to recover by some simple civil process from the warrantor the amount of any fines, penalties, and costs he has incurred by reason of a false warranty ; but it is contrary to public policy that the public should be concerned in the obligations entered into between individual traders for the protection of their own interests.

Nothing more effectual to increase the efficiency of the Acts and to prevent fraudulent adulteration could be designed than the simple repeal of the warranty clauses, with the insertion of such powers to consignees to recover costs after conviction from the warrantors as justice dictates.



Treatment by X-Rays.

The Röntgen-Rays in Therapeutics and Diagnosis. By WILLIAM ALLEN PUSEY, A.M., M.D., Professor of Dermatology, University of Illinois; and EUGENE WILSON CALDWELL, B.S. Director X-ray Laboratory, University and Bellevue Hospital. Medical College, New York. London and Philadelphia : W. B. Saunders & Co. Octavo. Price 21s. net.

IN spite of the somewhat numerous treatises that have recently appeared on the subject of X-rays, the present work is the first in this language to deal at length with the therapeutic aspect of the subject. Conflicting and often exaggerated statements have been made concerning the results of X-ray treatment in disease, and a work which will help towards the crystallisation of our knowledge of these effects deserves careful consideration. Little need be said about the first section of the book, in which a careful description is given of the various kinds of apparatus in use for the generation of the rays and the methods of applying them in skiagraphy, fluoroscopy, &c. The writer is a recognised authority on the technical part of the subject, and has himself added to the armamentarium of the X-ray worker by the introduction of an electrolytic interrupter.

The great diversity of opinion with reference to the best type of apparatus and methods of procedure are accounted for by the importance of the personal equation and the fact that excellent work has been done with almost every known type of apparatus.

The second and larger part of the volume is chiefly devoted to the consideration of the therapeutic application of the rays. In the opening chapter on the effects of X-rays on the tissues the author expresses the view that the pigmentation of the skin from moderate X-ray influence differs in no respect from that produced by exposures to sunlight. The facts that freckles occur in individuals who show the same phenomenon under exposure to sunlight, and that the reaction of different individuals in respect to the deposit of pigment is very similar to

their reaction to sunlight, are given in support of this hypothesis. The inflammatory effect produced by X-rays upon tissues are divided into four classes corresponding with the four degrees of ordinary burns. A fifth form or chronic X-ray dermatitis is also described, in which atrophy of the skin, hyperkeratosis, changes in the nails, hair, &c., may occur ; and " Precancerous keratosis " is also referred to.

As regards deep-seated X-ray effects, the author believes it highly improbable that these can be produced upon normal tissues without the production of more intense effects in the overlying parts ; but he does not agree with the statements of some observers that X-rays do not affect the deeper tissues, and he quotes cases of his own in support of his contention. The action is, however, less than on the superficial parts. Other general symptoms, such as vomiting, vertigo, and prostration, have not occurred in his experience.

The question of X-ray "burns" is dealt with at some length, and the exhaustive analysis given by Codman is quoted. Figures are given showing that in a good proportion of cases the first symptoms of dermatitis are noticed within the first few days after exposure and that long-delayed reaction is relatively uncommon. It is interesting to note that the author had three cases of relapses of dermatitis about two months after a former attack. In one of these cases there was a second relapse six months after the first.

In two of them the recurrence was indistinguishable from a vesicular eczema, and it was not proved that the apparent relapse was not a dermatitis from external irritation in a portion of the skin whose normal tolerance had not yet been reestablished.

In our own experience a similar case occurred ; the first relapse remained localised, and the second began in the area in which the dermatitis originally took place, and subsequently involved the whole body.

With regard to idiosyncrasy to the action of the rays, the writer considers that there can be no doubt of the variation in the susceptibility of individuals, but this has never been sufficient in his experience to amount to marked idiosyncrasy. The difference rarely amounts to more than four to one. The only part of the body which he has found to show particular

susceptibility to X-rays is the eyes. The first statement would probably have the acceptance of most workers in this country. We have only had one case in which the susceptibility was sufficiently marked to deserve the appellation of idiosyncrasy. With regard to the second point, the eyes have, in our experience, shown no greater susceptibility than other parts of the body. The writer does not consider, with Lancashire, that any immunity to dermatitis occurs after repeated exposures, but rather that there is an increased susceptibility. He fully recognises the anodyne effect of the X-rays, and this is not confined to malignant diseases or to superficial conditions.

The histological changes produced in the tissues by the X-rays are fully discussed. The following conclusions from the author's observations may be quoted :—

1. X-rays influence especially or exclusively the cellular elements of the skin ; these are influenced primarily, and undergo a slow degeneration, while connective tissue, elastic tissue, musculature, and cartilage are changed only in a slight degree, and suffer only secondarily, as a result of the cellular degeneration and the inflammatory reaction consequent to it.

2. The degeneration affects the epithelial cells in the highest degree, and to a less extent the cells of the glands, the vessels, the muscular tissue, and the connective tissue.

3. The degenerative appearances are of various kinds, and affect both the protoplasm and nuclei.

4. As soon as the degeneration of the cells has reached a certain point, an inflammatory reaction appears, which manifests itself in a marked infiltration of the vessels, with gathering leucocytes and marked emigration of the blood-corpuscles. When greater cell-degeneration occurs as a result of stronger exposure, collections of leucocytes press into the mass of degenerated cells and accomplish their further destruction.

5. The changes in the large and small vessels are apparently of great importance, as affecting the further development and slow healing of the ulcerations.

The microscopic changes in psoriasis, lupus, lepra, and carcinoma under X-rays are then discussed. Practically all observers agree in describing two sorts of changes :—First, evidences of peculiar structural changes in the cells themselves ; secondly, certain proliferative changes in the inner coats of the

blood-vessels. The most significant feature is the degeneration and disappearance of pathological tissues under X-ray effects, which are not sufficiently intense to destroy the healthy stroma. A reaction must be produced sufficient to cause destruction of the diseased tissues which constitute the pathological process, but not sufficient to destroy the surrounding healthy tissue. In this country the histological changes have been described by Pernet and Sequeira and summarised by MacLeod.

In the chapter on the effect of X-rays on bacteria a good summary is given of the results of various workers. The influence of X-rays *per se* upon bacteria is practically *nil*. On the other hand, the author points out that there is considerable evidence to show that in living tissues the vitality of micro-organisms is interfered with. In syphilis, for example, the pus rapidly disappears under X-ray treatment, and septic ulcers speedily become clean and free from micro-organisms.

This may be accounted for by the activity of the tissues themselves, the cells of which are stimulated and better able to resist the invasion of bacteria. According to some observers increased phagocytosis is the cause.

The author considers it proved that the various phenomena observed in the tissues are caused by the X-rays themselves, and expresses the opinion that it is the actinic properties of the rays which are specially concerned in bringing about these changes.

The chapter on the technique of X-ray exposures for therapeutic purposes will be useful to all who are interested in the practical part of the subject. The methods of various workers are given and the author recognises that no hard-and-fast rules can be laid down, much depending upon the kind of apparatus employed and the varying conditions of exposure.

The effects of X-rays which offer indications for therapeutic application are stated as follows :—

- (i.) Their effect in causing atrophy of the appendages of the skin ;
- (ii.) Their destructive action upon organisms in living tissues ;
- (iii.) Their stimulative action upon the metabolism of tissues ;

- (iv.) Their power of destroying certain pathological tissues;
- (v.) Their anodyne effect.

As a corollary to the above the following groups of affections (abbreviated from that of the writer) offer a possibility for the favourable action of the X-rays.

I. In the removal of hair :—hypertrichosis, sycosis, favus, tinea tonsurans, tinea barbae or tinea sycosis.

II. In causing atrophy or diminution in size or functional activity of sebaceous glands :—comedo, acne, acne rosacea, lupus erythematosus (?).

III. In causing atrophy of sweat-glands :—hyperhidrosis.

IV. Possibly where it is desired to cause exfoliation of the nail.

V. In destroying bacteria in tissues :—*e.g.*, in lupus, although in this disease their effect in destroying tissues of low resistance is doubtless of greater moment than the germicidal effect. Also in other bacterial diseases some of which have been already mentioned, *e.g.*, sycosis, acne, tinea, favus, eczema (?).

VI. Their stimulating effect upon the metabolism of the skin—this effect probably explains the success following their use in chronic indurated eczema, lupus erythematosus, lichen planus, psoriasis and other indurated inflammatory diseases of the skin.

VII. In causing destruction of tissues of low resistance without the destruction of the healthy stroma. This is the theoretical indication for their use in various malignant diseases and in other processes in which cells of low resistance are concerned. This group includes carcinoma, sarcoma, tuberculosis, pseudo-leuchæmia and leuchæmia.

VIII. Their anodyne effect :—in painful malignant and inflammatory conditions, in neuralgias and in itching dermatoses.

The writer does not claim that this classification is entirely satisfactory or accurate in the present state of our knowledge; but concerning the implication that the use of X-rays is entirely empirical he holds strong views. He contends that there is no therapeutic agent against which such a charge can less justly be brought. Their use is in fact much less empirical than that of quinine, mercury or arsenic, or many other of our most useful remedies.

The remainder of the work, comprising over 230 pages, deals in detail with the treatment of the various pathological conditions enumerated above. Not only are full references made to the work of various writers on the subject, but the author's own experience is embodied in the notes of a large number of cases which have come under his personal care. The cases are illustrated by a series of beautiful photographs.

The vexed question of the employment of X-rays in hypertrichosis is treated in the temperate and impartial manner which is evident throughout the book. There can be no question that hair can be permanently removed in some cases without damage to the skin by repeated X-ray exposures. In some cases a satisfactory result cannot be obtained. The method is only a qualified success, and is only recommended in those cases in which a large surface is to be treated. Where only a few hairs are to be removed, electrolysis is the better method. In two cases acute dermatitis was produced, and the results in these cases were more radical than in any others. The author's experience is in accord with those who report that to produce alopecia some dermatitis is required, and that the result is more permanent when the dermatitis is considerable.

The treatment of alopecia areata, tinea tonsurans and favus is discussed, but no personal experiences are given. A case of non-parasitic sycosis was treated and a slight dermatitis set up ; the hair has since returned, and the disease has not recurred in ten months. Good results were obtained in acne and rosacea. X-rays are recommended for hyperidrosis on theoretical grounds alone. As regards the inflammatory diseases of the skin, there is a good deal of evidence of the value of X-rays in both acute and chronic forms of eczema ; and itching may be relieved.

Patches of psoriasis can be cleared up, but there is no reason to believe that X-ray treatment will overcome the marked tendency of the disease to recur. It is said to be effective in certain intractable cases in which the ordinary remedies have failed. A case of lichen planus was treated with marked success. A guarded opinion is given of the value of the X-rays in lupus erythematosus, and only one case is reported ; but the writer thinks that reports of cases show better and more constant results than are given by any other method. Some

cases will not be effected and relapses must be expected ; but in spite of these drawbacks there is still a chance of the method proving an advance in treatment. Mild exposures should be tried first, and intense exposures resorted to only when the weaker have persistently failed. No mention is made of the unfortunate tendency of the rays to produce telangiectasis. If not an actual contra-indication, it must be carefully borne in mind in the treatment of a disease in which vascular dilatation plays so important a part. Successful results are quoted in prurigo and urticaria pigmentosa.

With reference to the treatment of lupus by X-rays, the writer considers that no method has ever shown nearly such good results except Finsen's method. Between the results obtained by these two he is convinced there is no room for choice. In his opinion both show scarring of exactly the same character, and there is no reason to believe that either has any advantage over the other as regards the permanency of the results. With the statement that with the improved lamps now in use the length of time required for treatment by Finsen's method has been much reduced, we cannot entirely agree, if by the term "improved lamps" he refers to the small lamps in which the light-rays are not brought to a focus. In our experience these are of little or no service in the treatment of lupus.

In the cases treated it was never found necessary to carry the reäction to the point of producing even a superficial necrosis ; nothing would be attained by such reäction that could not as well be attained by the simple production of an acute weeping dermatitis. The method recommended is first to see if the results cannot be obtained by producing a moderate reäction, and only after this fails to resort to radical exposures. We venture to think that even "an acute weeping dermatitis" is somewhat unnecessarily severe for the majority of cases ; and a case must be kept under observation for long periods before any one treatment can be said to have failed. In three out of the four cases treated the length of treatment before the disease disappeared was five months in two and four months in one case.

The results of X-rays in tubercular ulcers and scrofuloderma, in tubercular vesical fistula, tuberculous glands, tuberculosis of larynx, joints, genito-urinary tract, abdominal tuberculosis,

and pulmonary tuberculosis are given and illustrated by cases. Syphilitic ulcers can be cleaned up like any other infected ulcers by X-ray exposures ; but it is doubtful if X-rays have any rôle to play in the treatment of gummatous syphilides, and there is certainly no reason to substitute X-rays for the ordinary methods of treatment.

The use of X-rays for leprosy and blastomycetic dermatitis is referred to. A trial of the rays is warranted in actinomycosis, although there are no reports upon the subject in the literature.¹

A comprehensive account is given of the results obtained in "cutaneous carcinoma or so-called epithelioma." The use of these terms to the exclusion of the convenient clinical name of rodent ulcer is, however, apt to be misleading. There can be no doubt of the difference in reference to X-ray treatment as well as in the clinical course of rodent ulcer, as opposed to that of true epithelioma. In our experience this has been so marked that it might be said to constitute a diagnostic point, if another were needed, between the two diseases. The danger, however, lies in treating epithelioma (in the clinical sense) with X-rays when excision should be performed as soon as possible. In rodent ulcer, where metastasis does not occur and the progress of the growth is slow, X-rays may be used with propriety.

The author has treated 25 successive cases of carcinoma of the breast in which the results allow some opinion to be formed as to the efficiency of the treatment. Of these 18 were recurrent and 7 primary. He has also given X-ray exposures to 14 cases as a prophylactic measure after operations for carcinoma of the breast and before any evidence of recurrence had appeared. Of the 18 cases, 8 showed practically no result, except, in most instances, marked relief from pain. In all there was involvement of the supraclavicular glands at the beginning of treatment, and probably intrathoracic metastasis as well. One patient was relieved of the evidence of carcinoma locally, but died soon after, presumably from metastasis. The remaining 9 cases showed satisfactory results. All the cases were practically beyond relief by any other method ; and the failures in this series of cases may readily be admitted, and still the

¹ An unpublished case has been treated with benefit by W. K. Wills, of Bristol.

method be amply justified by the results. In 7 cases of primary carcinoma of the breast, 1 was symptomatically cured; in 2 who died the masses had become impalpable and showed only a small mass of fibrous tissue *post mortem*; in 3 the disease was checked; and in 1 there was no result. The author lays due stress on the importance of operation in suitable primary cases and the employment of X-rays in such cases only as are deemed inoperable by surgeons, or where the patient has unequivocally declined operation. Notes of 2 cases of mediastinal tumour are given, and of a case of carcinoma of the oesophagus in which vigorous X-ray exposures over the chest or back resulted in a gain in weight, and disappearance of pain and difficulty of swallowing. Seven months after the commencement of treatment the patient's weight was almost normal; there was no pain; he could swallow without difficulty, and felt well and vigorous. Good results were also obtained in cases of deep-seated carcinoma of the head and neck, and pelvis. In 9 cases of abdominal carcinoma no positive results were obtained. In 2 cases in which the rectum and anus were affected the only results were the checking of discharge, the relief of pain and some shrinkage in the size of the tumours.

After referring to the results of various writers in the treatment of sarcoma by X-rays including Coley's 10 cases, the author relates 11 cases of his own treated by this method. In 4 cases there was general sarcomatosis when treatment was begun, and more than palliative results were not expected. One was perhaps a complete failure, and in another, in which there was an extensive osteo-sarcoma, only relief of pain resulted. In 3 symptomatic cure was effected, the patients having been relieved of pain and restored to health, and the tumours having disappeared. If these cases had been operable no better results could have been obtained. One case proved an ultimate failure, but opportunity was not offered for adequate treatment. Reference is made to a case of melano-sarcoma of the eye, treated by Harper, in which there was no evidence of recurrence after nine and a half months. The author also treated a case of glioma of the retina recurring after operation, the exposures prevented the development of the tumour on the surface. In a patient with mycosis fungoides continued

treatment was declined, but the good results obtained by Jamieson and Scholtz are referred to.

There is a short chapter on the prophylactic use of the rays after operations for malignant diseases. They may also be useful as a preliminary to operation where for any reason it is not advisable or is impossible to operate at once. The author claims to have been the first to have treated a case of Hodgkin's disease by X-rays. In several cases the glands disappeared, and the general condition improved. A case of leucæmia was treated with X-ray exposures for a month with no effect; a second case received some benefit. Beneficial results are referred to in neuralgias, rheumatism, and pruritus. Goitre was treated without effect. The effects of X-ray treatment on scars, elephantiasis, callous sinuses, chronic ulcers, nævi, verruca, clavus, and leucoma of the cornea are briefly described; no mention is made of trachoma or tuberculosis of the conjunctiva, cases of which have been treated with X-rays in this country.

The last chapter, in which the author refers to some special points, such as the effects of X-ray exposures on the general health, the supposed danger of producing metastasis of malignant growths, &c., concludes a work which is certainly second to none that have as yet appeared. The general style and get-up of the book are above the average, it is well and fully illustrated by drawings and photographs, and is further embellished by several coloured plates, more perhaps to be admired for their artistic merits than for their utility. It is written in a clear and convincing manner, and gives unmistakable evidence of an intimate and practical knowledge of the subject. The judicious and impartial statement of the facts should do much to place the subject on a sure footing, and prove of great assistance to all who require a readable and trustworthy account of the value and effects of the X-rays in therapeutics.

S. ERNEST DORE.



Reviews of Books.

Elements of Surgical Diagnosis. By A. PEARCE GOULD, M.S. (Lond.), F.R.C.S., Surgeon to the Middlesex Hospital, and Member of Council of the Court of Examiners of the Royal College of Surgeons of England, &c. 3rd edition, revised and enlarged. London: Cassell & Co., Ltd. 607 pages. Price 7s. 6d.

WE give a hearty welcome to a new edition of this little work, from which both student and practitioner can gain much benefit. The whole text has been revised, and much of it rewritten, whilst new sections dealing with the Intracranial complications of Middle-ear Disease, with Abdominal Tumours, and with certain acute abdominal lesions needing surgical assistance, have been added. The first of these is good, though scarcely so complete as one might have desired, and the statements are sometimes a little too generalised. Thus cerebral abscess in connection with middle-ear disease is not always associated with a low temperature and slow pulse. For the two new abdominal chapters one has nothing but admiration ; they are excellent expositions of a difficult subject. The value of skiagraphy and of an examination of the blood is suitably recognised throughout the book, and modern methods of examination are usually introduced, although one notable exception to this exists in the total absence of any reference to the proctoscope. Two points suggest themselves in the older material in which some slight modification might be advisable :—In the differential diagnosis of a hernia, it is stated that if it is external to the pubic spine, it is femoral in type ; if internal, it is inguinal. This is of course true in the later stages of a hernia ; but when the diagnosis is more uncertain, viz., in the earlier stages, when the hernia, if inguinal, is still in or only just outside of the canal, it is not true. Students should be warned as to the fallacy of this test in connection with a bubonocele. There is also a noticeable omission in connection with hip-disease, viz., the fact that abscesses not infrequently

appear in front of or behind the trochanter major, and may easily be mistaken for a suppurating gluteal bursa or *vice versa*. This bursal lesion is by no means uncommon, and yet it is not referred to, whilst the much rarer affection of the ilio-psoas bursa is fully differentiated from hip-disease. The work throughout is free from illustrations ; but we cannot but think that a diagram illustrating the position of the cortical centres would add much to the lucidity of the chapter dealing with affections of the brain.

Modern Surgery, General and Operative. By JOHN CHALMERS DACOSTA, M.D., Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia; Surgeon to the Philadelphia Hospital, and to St. Joseph's Hospital, Philadelphia. 4th edition, re-written and enlarged. 1099 pages. 707 illustrations. Philadelphia, New York, and London : W. B. Saunders & Co. Price 21s. nett.

THE last edition of this work was reviewed in THE PRACTITIONER in June, 1901, and we then expressed our pleasure at the improvement that had taken place in it as compared with the earlier editions. This improvement still continues. The work has been considerably enlarged, and altogether it is now to be placed in quite a different category to what it was formerly. This is especially noticeable in the general questions of surgery dealt with in the earlier portions of the book, and we can give a hearty commendation to these ; indeed, a most excellent representation of modern ideas of surgery is contained within a comparatively moderate limit. There is perhaps at times too great a tendency to epitomize modern literature, and to include things that are suggested, but have not yet gained a full consent as to their acceptance from the profession ; whilst sometimes there is unnecessary elaboration in unimportant details of classifications, as, for instance, when we have, methodically arranged, 19 types of aneurysm ; ending up with a Verminous Aneurysm met with in the mesenteric artery of a horse. Some parts are still very far from giving an up-to-date account of the subject treated, and notably so Diseases of Bone and Orthopædic Surgery. The Section on Joints is good on the whole, but surely

Charcot's disease is worthy of more than 15 lines, and Acute Suppurative Arthritis requires for its description and treatment more than 18 lines. There is also too much tendency to tack men's names on to well-recognised affections, e.g., Jacob's ulcer for rodent ulcer, Marjolin's ulcer for an epithelioma developing on a scar, Shekelton's aneurysm for a dissecting aneurysm, whilst Pott's name is attached to an aneurysmal varix. No good can come of such senseless nomenclature. Some of the arrangements are rather weird still ; thus sinus and fistula are dealt with in the chapter devoted to ulcers ; and after discussing diseases and injuries of the head and neck, chest and abdomen, there is a sudden break to introduce a chapter on anaesthesia and anaesthetics, which precedes those devoted to skin-affections, the thyroid body, and lymphatics. Then come Bandaging and plastic Surgery, and after these a lengthy notice of Diseases and Injuries of the Genito-urinary organs. How can such an arrangement commend itself, especially since in review after review this hotch-potch jumble has been condemned ? A few other objections arise. On page 167 we are told to "asepticize" a wound from which erysipelas has started ; with the best of good intentions we doubt any one's capabilities of doing such a thing. Subcutaneous ligature is still described and figured as a suitable treatment for nævus; in a work entitled *Modern Surgery* this antiquated procedure might surely be omitted. An attempt is made to differentiate between an atheromatous cystoma and a dermoid cyst, but we fail utterly to grasp the value or significance of the distinction ; moreover, at page 276 we are told that the former occurs in the ovary, orbit and root of the tongue, whilst on page 684 a description of a sublingual dermoid is given. And that leads one to note once again, as in previous editions, that there is no mention of any lesions of the tongue but tongue-tie and carcinoma, and the very name glossitis is not included in the index. Ranula is said to have an origin in the submaxillary duct, and Senn's hydrogen-test is still advised for determining whether or not the intestine is ruptured. A bewildering number of methods of intestinal suture is given, and we pity the poor student who has to cram them up. In conclusion, we must admit that an honest and on the whole very successful effort has been made to improve the work ; and

if more attention were devoted to the special regions (other than the abdomen) and perhaps general questions were curtailed a little, then the work would be of more real use alike to the student and to the practitioner, whose main object in consulting it is to know how to treat a patient.

Modern Bullet Wounds and Modern Treatment. By Major F. SMITH, D.S.O., R.A.M.C. London : J. and A. Churchill. 94 pages. Price 3s. nett.

MUCH of this little book is really sound, but in the presence of much more complete recent books on the subject it is difficult to see the necessity for it, especially as it deals only with one section of the wounds of warfare. Some of the pages can hardly be of use to the professional reader, being filled with discursive matter obviously intended to confute some of the irresponsible critics of army medical arrangements. Even purely professional matters are not above criticism. Thus the author advises partial excision of the wrist and elbow-joint ; but it was abundantly proved during the late War that such measures were not only not satisfactory, but were far inferior to the complete operation in the results attained. Moreover, we believe that it will be generally agreed that a septic infection of the knee-joint is not nearly such a simple matter as is suggested here. As to actual work on the field of battle, we fully agree that the indiscriminate and too early removal of the wounded by "rough-and-tumble" methods cannot be too strongly condemned ; but would it ever be safe to entrust bearers with the administration of morphia hypodermically as a first-aid proceeding, as suggested here ?

The Principles and Practice of Surgery for Students and Practitioners. By GEORGE TULLY VAUGHAN, M.D., Professor of the Principles and Practice of Surgery, Georgetown University, Washington. Philadelphia and London : J. B. Lippincott & Co. 569 pages. 281 illustrations. Price 15s. nett.

IN this work there is a minimum amount of information as to surgical science and technique, illustrated by a certain number of moderately good pictures, the origin of which

from other authors is frequently not acknowledged. It is insufficient for either student or practitioner, and we cannot advise our readers to spend either money in buying it or time in reading it.

A Treatise on Diseases of the Rectum, Anus, and Sigmoid Flexure. By JOSEPH M. MATHEWS, M.D., LL.D. President of the American Medical Association, 1898 ; Professor of Surgery and Clinical Lecturer on Diseases of the Rectum, Hospital College of Medicine, &c. Pp. 589. New York and London : D. Appleton & Co. Price 21s. nett.

THIS is a loosely-written work with a large amount of padding and not too much material of any value. There are a few "author's operations" or methods, which seem fairly familiar, and lengthy references to cases and operations reported elsewhere, add bulk to the work. The chromo-lithographs are not beautiful, and represent such proceedings as the application of the clamp and cautery for piles, division of a fistula with a bistoury, operation for fistula by a Mathews' Fistulotome (!), and such-like commonplace procedures which form the A B C of rectal surgery. The other "numerous illustrations" include such things as a bag to contain the instruments required for rectal work ! In view of the enormous number of books now in existence and their needless multiplication which is still proceeding, we feel impelled to protest against the issuing of works such as this one, which is of little value except to advertise the author's name.

Aids to Surgery. By JOSEPH CUMMING, M.B., B.S., F.C.S.S., Senior Resident Medical Officer, Royal Free Hospital. London : Baillière, Tindall and Cox. 402 pages. Price 4s. 6d. cloth ; 4s. in paper.

THIS is an excellent compendium of the main facts of surgery, in so far as any compressed information of this type can attain excellence. It consists practically of Rose and Carless's *Manual of Surgery*, with a little addition of Cheyne and Burghard on *Surgical Treatment*, and Bland Sutton on *Tumours*. It is a decided improvement on many cram-books, in that it is much more readable, and does not give long tabulated

lists. The material is usually accurate, but we have detected a few errors that need rectification. Thus on page 6 it is said that catgut can be sterilised by soaking it in 1-in-20 carbolic for 24 hours ; that is quite an insufficient time. Again on page 8, the heat of an inflamed part is said to be due to the excessive chemical changes going on in it ; in this statement the author has not followed his authorities and is incorrect. In our copy there is an error in binding, viz., a transposition of sheets 3 and 4 ; this is not the first time by many that a complaint of this character has reached us concerning books issuing from Henrietta Street.

The After-treatment of Operations ; a Manual for Practitioners and House Surgeons. By P. LOCKHART MUMMERY, F.R.C.S. (Eng.), B.A., M.B., B.C. (Cantab.), and Demonstrator of Operative Surgery, St. George's Hospital. London : Baillière, Tindall and Cox. Price 5s. nett.

MR. MUMMERY has done well by incorporating into a single volume the fragmentary information scattered here and there through surgical text-books concerning the after-treatment of operations. Fully recognising the fact that methods vary with the man to a very considerable extent, he has not attempted to discuss all the suggestions that have been made, but he has used his judgment in making a selection. On the whole we consider his work has been done well ; tradition has not been unwisely pressed into service, and quite a number of modern plans have been incorporated. Thus the value of giving plenty of fluid after a laparotomy is emphasised ; but the method of introducing it beneath the skin is only mentioned with disfavour. If given in a proper way by this route it is a valuable adjunct. Crile's experiments on Shock are alluded to somewhat fully, and lengthy notices as to treatment are appended. We are sorry to note that in the treatment of amputations of the breast it is recommended that the arm should be kept to the side ; we advise the author to nurse his breast-cases with the arm abducted to a right angle, and his patients will then rise up and call him blessed, because the painful abduction exercises will no longer be required. On the whole the book is good and useful ; but why was it spoilt by the atrocious pictorial

representations that are scattered through it? A very little expenditure would have secured figures which would not offend every artistic faculty of the reader.

The Sterilisation of Urethral Instruments, and their Use in some Urinary Complaints. By HERBERT T. HERRING, M.B., B.S., M.R.C.S. London: H. K. Lewis. Price 5s.

IT is scarcely possible to exaggerate the misery which may be caused by septic trouble affecting the bladder, and the number of those who are compelled to rely on catheterisation towards the end of life is very considerable. It is, therefore, most desirable not only to impress upon such sufferers the absolute need of exercising the greatest care in ensuring the sterility of the instruments which they use, but also to devise some suitable method, free from undue complexity, which they may be recommended to adopt for the purpose. Mr. Herring has done a good work in this direction, and his little book may be commended to the careful study of those whose duty it is to advise sufferers from prostatic and urethral troubles as to the management of their ailments. The book contains much indispensable information as to sterilisation and use of catheters, for the former of which Mr. Herring has devised ingenious arrangements; along with some brief advice on the treatment of gonorrhœa, and on the examination of the urine in cases of genito-urinary trouble. It is well and fully illustrated, and clearly written.



Notes by the Way.

The Coming Meeting of the B.M.A. at Oxford.

THE forthcoming meeting of the British Medical Association at Oxford bids fair to be a great success, both on its serious and its lighter side. Oxford affords an ideal spot for such a meeting, as there is to be found there endless interest for the sight-seer, while the atmosphere of the University should be stimulating to the workers and thinkers of the medical profession, so that valuable papers and discussions are to be expected. The Oxford Medical School has now taken its place as one of the important centres of medical education ; and if it is still distinguished rather for the character than the number of its alumni, this is a matter for congratulation rather than for regret. The old jibe that it was a "lost medical school" has long come to be a mere proof of the ignorance of medical matters existing in the mind of anyone who now repeats it ; though we remember to have seen it introduced not many months ago into an article in a weekly medical journal which, in view of the hospitality to be extended to the British Medical Association at Oxford, might have been expected to refrain from such bad manners. As to the fulness of this coming hospitality, there is no room for doubt ; we hear that the various colleges are offering to find accommodation for a certain number of members of the Association, and that the welcome to the distinguished visitors who are to be present will be worthy of the University and city. The meeting will probably be a memorable one in the history of the Association.

* * * * *

Diet in Disease.

WE publish this month a second article upon the subject of diet, a branch of treatment which is somewhat neglected in the ordinary training of our students of medicine. Yet it is a subject which possesses considerable interest and importance, and one which engaged the attention of physicians in very early times. The ancient Greeks had reduced the dieting of athletes to a fine art, if not to an exact science ; and throughout the history of

medicine it has engaged the minds of practical and theoretical writers. In the current number of the *Johns Hopkins Hospital Bulletin*, Dr. McCrae gives an interesting account of "George Cheyne, an old London and Bath physician (1671—1743)," who adopted for himself a rigid vegetarian system of diet, to the derision of his contemporaries. He does not seem to have insisted upon it as of universal application, holding that ordinary mixed diet was good for the majority of men ; but he strictly adhered to nuts and vegetables for his own use. We may quote from Dr. McCrae's paper the following verses sent to Cheyne by one of his medical colleagues ; they were new to ourselves and may be so to our readers :—

Dr. Wynter to Dr. Cheyne :

" Tell me from whom, fat-headed Scot,

Thou didst thy system learn ;

From Hippocrates thou hast it not

Nor Celsus nor Pitcairn.

Suppose we own that *milk* is good

And say the same of *grass* ;

The one for babes is only good,

The other for an *ass*.

Doctor ! one new prescription try,

(A friend's advice forgive)

Eat *grass*, reduce thyself and *die*,

Thy *patients* then may *live*."

To which Dr. Cheyne made answer :

" My 'system,' Doctor, is my own,

No tutor I pretend ;

My blunders hurt myself alone,

But *yours* your dearest friend.

Were *you* to milk and straw confined,

Thrice happy might you be ;

Perhaps you might regain your mind,

And from your wit get free.

I cannot your prescription try,

But heartily forgive ;

'Tis natural you should bid *me* die

That you yourself may live."



**Pure Food and
Drink.**

DR. PARKES' article which appears on another page calls attention to a very serious evil which demands speedy correction. We

live under the comfortable impression that the benevolence of our legislators, coupled with the vigilance of our local authorities, has made it impossible for the unscrupulous tradesman to supply us with the necessities of life in a seriously adulterated condition or of dangerously inferior quality. This is apparently far from the actual case ; there is no uniformity of system in the inspection of food and drink all over the country, and what is condemned in one locality as unfit for consumption may pass muster in a neighbouring district as good enough for its denizens. Much depends on the unaided judgment of the local analyst, who has no authoritative rules to guide him, and little means of comparing notes with his colleagues in other parts of the country. The taking of samples for analysis is also conducted in a haphazard manner according to the caprice of local authorities. Nor are the Food and Drugs Acts themselves immaculate : thus it appeared recently that while it was illegal to add water to butter, it was legitimate to add milk—thus arriving at precisely the same result—as long as the fact of the admixture was stated in selling the article. The whole matter is in rather a chaotic state, and is likely to remain so until it is taken in hand once for all and placed under the control of a central department. It is to be hoped that the Royal Commission may make some practical recommendation in this direction.

* * * * *

**Standardisation
of Drugs.**

ON this subject Mr. C. G. Moor writes to us, referring to a review of his book on "Suggested Standards of Purity for Food

and Drugs," which review appeared in our April number. We regret that we have not space to print the latter *in extenso*. Mr. Moor points out that there is no English work which covers quite the same ground as his does ; it constitutes a pioneer attempt to deal with the subject, and the work was therefore beset with difficulties. No standards of strength and purity are laid down for many pharmacopoeial drugs, and the most that can be done at present is to collect data from many

sources as to what we may expect to find in preparations made according to the official directions, and from them to construct standards which may in course of time be made obligatory. Mr. Moor concludes :—"I am now collecting matter for a second edition, and if any of your readers sympathise with my endeavour to provide a systematic compilation and interpretation of the results of analyses of foods and drugs, I shall be greatly obliged by any contributions in the way of criticisms or fresh data." We wish him all success in his work, which is certainly needed.

* * * * *

Coroners'
Courts.

WE saw not long ago in one of the daily newspapers that coroners' courts were to be abolished gradually in the State of New York, no further appointments to the office of coroner being made. We feel very strongly that this is a step in the right direction. Few things are more farcical than many "crowners' quests" in this country, and from the nature of things this must be so, for it is evident that the average coroner's jury is totally unfitted to determine the cause of death in any case of the slightest difficulty. In the vast majority of instances we read that "the verdict was in accordance with the medical evidence," and the result might have been arrived at much more simply and easily by an investigation conducted by a duly qualified medical officer appointed for the purpose, without the many disagreeable concomitants of a coroner's enquiry. In a few cases the medical evidence is neglected or travestied, and then the results are ludicrous. All verdicts may not come up to the standard of the celebrated pronouncement that "the deceased died from a stone in the kidney which he swallowed while lying on a gravel path when drunk"; but they are often not much more valuable. The coroner's court is an anachronism, and on the whole an undesirable survival. It is difficult to find individuals endowed with both the legal and the medical knowledge demanded by the post, and still more rare to find these endowments joined with the dignity, courtesy, and impartiality which a quasi-judicial office requires. The procedure of a coroner's court inspires neither respect nor confidence; and it is too often a field for the ventilation of scandals concerning

private life, which are dragged to light over the death of some member of a family. In every way it would seem better to have a preliminary enquiry conducted in private by a skilled medical officer ; to be followed, if any suspicion of foul play arose, by an investigation in a court of law. Such an arrangement, coupled with a stringent enactment that no body should be buried without a medical certificate of death or an order from the official just alluded to, would form a much greater safeguard against crime than the present cumbrous and unsatisfactory system.

* * * *

**Isolation of
Small-pox in
Germany.**

THE recently-published report by Dr. Bruce Low on the methods adopted in Germany for the isolation of cases of small-pox affords interesting testimony to the value of vaccination and revaccination, if thoroughly carried out. Whereas in our own country, where the faddist is rampant, we have to build and maintain costly hospitals for the isolation of cases of small-pox ; in Germany so rare is the disease and so well is the community protected by scientific preventive measures that isolation is effected—if a case occurs by importation from some foreign country—in the ordinary general hospitals in the towns, and no spread of the disease takes place. We may quote the following paragraphs as containing the gist of the report :—

“ It has been asserted in England by persons who have little or no faith in the value of vaccination as a prophylactic against small-pox, that the comparative immunity of the German nation from that disease is due, not to statutory vaccination and revaccination, but to the strict system of isolation of small-pox which is carried out in Germany. But the evidence given to me by the eminent medical men with whom I personally conferred, entirely refutes this assertion ; and one and all joined in the representation that compulsory vaccination and revaccination were Germany’s great protectors against small-pox.

“ The description which I have given of the position of the small-pox pavilion at each of the hospitals visited in Germany shows conclusively that there is not in that country [any]

'strict system of isolation of small-pox' in the sense as we in England understand it. With one or two exceptions the pavilion is shut off in no way from the rest of the hospital, and there is no limitation in the number of persons residing within the several zones around the hospital. Nor is the administration of the small-pox pavilion entirely separate from the general administration of the hospital establishment. The German nation, therefore, by the agency of compulsory vaccination and revaccination is able to dispense with separate small-pox hospitals altogether. It is not necessary there to provide for small-pox a separate site nor separate administration. Germany is in this way freed from great expense, not to speak of the suffering and the inconvenience which fall upon the English nation. But all this could not be achieved in Germany unless the Law of Compulsory Vaccination and Revaccination were thoroughly carried out."

* * * *

The King's
English.

IT is curious that at most of our schools—at least it was so in our own time—no attention is systematically paid to the study of English grammar. The rules of Latin and Greek grammar were duly rubbed in by the approved methods, but those of our own language were supposed to come by nature ; very often, it is to be feared, they do not. In these days when novels and newspapers are the principal literary pabulum of too many of us, there is some danger of the art of English composition becoming lost: at least a perusal of a fair quantity of medical and scientific papers tends to produce that impression. We have recently read with interest, and we hope with profit, a little book by Professor Clifford Allbutt, in which he gives fatherly advice to those about to embark on the perils of authorship—especially the perils associated with the composition of theses for the degree of M.B. at Cambridge—as to the pitfalls and snares which await the aspirant to prose composition. Although we all, as the *Bourgeois Gentilhomme* discovered, spend our lives in talking prose, yet when this is transferred to paper, it does not always appear satisfactory to the austere critic. Professor Allbutt quotes, to illustrate his wise saws, many instructive modern instances taken, not only from medical papers, but also

from more pretentious writings. We fancy that few medical writers who study these canons will find their withers unwrung ; we admit to having winced ourselves. At times we have perhaps ventured to doubt the infallibility of the Censor—or should it be Arbiter Elegiarum ?—but the book is most pleasant and instructive reading, and we commend it to all who are thinking of venturing into print. They cannot fail to write the better for it ; though it may be doubted whether one in ten among their subsequent readers will appreciate the trouble that has been taken in preparing the literary dish, now that their palates are accustomed to the half-cooked material usually set before them by the writers of scientific articles.



Novelties and Notices.

HEMABOLOIDS.

THIS preparation is a pleasant-tasting brownish fluid, which contains iron derived from vegetable sources, along with extract of bone-marrow, beef-peptone, and nuclein. It is recommended for use in cases of anæmia and debility, the iron in it being absorbed readily without the production of gastric disturbance. It does not stain the teeth or give rise to constipation. The dose advised is one or two tablespoonfuls, two or three times a day. A combination of hemaboloids with arsenic and strychnine is also prepared for use in cases where these drugs are indicated.—The English agents are Messrs. Andrus and Andrus, 46, Holborn Viaduct, E.C.

FORMOLYPTOL.

This novel antiseptic preparation contains formaldehyde and boroglyceride, along with myrrh, eucalyptus, and other volatile substances, the whole forming an agreeable and fragrant fluid for use as a mouth-wash or injection. The bactericidal powers of the liquid have been tried upon a number of different microorganisms, and proved to be equal to those of mercuric chloride without the poisonous properties of the latter.—Messrs. Andrus and Andrus, 46, Holborn Viaduct, are the British agents.

HEMISINE PREPARATIONS.

Messrs. Burroughs, Wellcome and Co. have now introduced a number of different preparations of their product "Hemisine" or extract of suprarenal gland. We have received samples of tabloids (0.0003 grm.), Ophthalmic tabloids (0.0006 grm.), soloids (0.005 and 0.0012 grm.), and "enules" or suppositories (0.001 grm.). The quantities contained in the soluble pellets are such as to form solutions of convenient strength when dissolved in the requisite number of drops of water. Extract of suprarenal gland is now extensively used for haemostatic purposes both externally and internally, and the convenience of the solid form supplied by this firm is at once obvious, as it not only keeps good indefinitely, but is readily carried about.

"KEPLER" MALT-EXTRACT WITH HÆMOGLOBIN.

The possibility of administering iron in organic combination is now well established, and the use of actual hæmoglobin as a remedy has proved of considerable value. The idea of combining this substance with extract of malt is a good one, and the preparation is convenient and palatable. It combines with the iron the digestive properties of the malt and should prove of great use in cases of anæmia in which there is digestive irritability, so that the inorganic salts of iron are not well borne.

—Burroughs, Wellcome and Co.

QUASSIN ENULES.

These are rectal suppositories of the peculiar shape to which the name of "enules" has been applied—a shape calculated to render them easy of introduction and retention. They each contain $\frac{1}{2}$ grain of amorphous quassain. They are recommended for use in cases of invasion by the Ascaris lumbricoides or Round Worm: perhaps this is a slip, as we should have expected that they would have been more adapted to the treatment of thread-worms.—Burroughs, Wellcome and Co.

JAEGER PURE-WOOL UNDERCLOTHING.

In spite of occasional voices raised against it, woollen under-garments are still recommended as the most suitable form of wear for our climate, and we see no prospect of their falling into disfavour. Among woollen materials the Jaeger Pure Wool Fabrics have established themselves as some of the best. We have recently received samples of some of these, which are made in varying thicknesses, and are soft, warm, and durable. We know of no substitutes at present which will take the place of wool for under-garments and of no better make than these fabrics, which may safely be commended on hygienic grounds.



Common Ailments and their Treatment.

HÆMORRHOIDS.

IT is, and always has been, customary to divide hæmorrhoids into two varieties, *internal* and *external*. It is important for the practitioner to recognise this classification before commencing the treatment. The external variety are either hypertrophies of the skin surrounding the anus, or venous tumours situated at the anal margin and covered by skin. Inflammation occurring in an external hæmorrhoid is popularly called "an attack of the piles," and this is the earliest symptom pointing to the presence of the condition. It is possible, by recognising the causes of this, to give advice which will often avert attacks. Persons suffering from external hæmorrhoids should be warned against constipation, over-eating, and over-drinking, all of which indirectly tend to produce inflammation. Too much and too little exercise should be equally guarded against. The anus should be carefully cleansed : neglect of this precaution often leads to attacks of inflammation.

When inflammation occurs, it is most important to recognise the condition as one of external hæmorrhoids and not to regard it as a prolapse of internal piles. Active exercise should be forbidden, and the diet must be restricted, very little meat being allowed, while alcohol should be entirely abstained from. The bowels should be caused to act by some simple aperient. Probably the best is sulphate of magnesia taken in the morning, fasting ; some aperient water may be substituted for this, and another very useful aperient is a mixture of equal parts of the confections of senna and sulphur taken in teaspoonful doses.

The local treatment consists in applying some soothing, and at the same time astringent, lotion or ointment. As a rule, ointments give more lasting relief than lotions and they are more easy of application. As an ointment we may order the following :—P. Bismuth. subnitrat., 3*j*; cocain. hydrochlor., gr. iv; vaselin. ad 3*j*, which will often be found very useful : or we may substitute, Extract. Hamamelidis, 3*j*; Adip. Benzoat., ad 3*j*.

If a lotion be preferred, liq. Plumbi subacetates, with or without Tr. opii, may be prescribed.

Under this simple treatment the attack will often very shortly subside. Sometimes, however, the symptoms increase in severity, the hypertrophied tags of skin around the anus become very oedematous, and the venous tumours undergo thrombosis. Pain is severe, especially on sitting, exercise, and defæcation. Some constitutional disturbance is also present. Such patients should be confined to bed, and either of the above-mentioned ointments, or Ung. Gallæ ē. opio, or equal parts of the extracts of opium and belladonna should be applied. Hot fomentations often relieve the pain. Some patients, however, prefer cold applications. The acuteness of the pain will often subside under this treatment. Should it not do so, it is sound practice to incise the oedematous tissue or to excise V-shaped portions of it. Should suppuration occur, early incision is imperative. In the event of the occurrence of thrombosis, the tumour should be incised, the clot turned out, and the cavity packed and allowed to granulate from the bottom.

Internal haemorrhoids are of three varieties, according to the classification adopted by most authors:—*Capillary, arterial, and venous*. The capillary variety resemble arterial nævi. Haemorrhage is their one sign. The haemorrhage is arterial, frequently repeated, and very exhausting. A digital examination of the rectum will probably reveal nothing. The diagnosis is based on the one sign—haemorrhage—and on ocular inspection. The haemorrhage can often be controlled by astringent injections into the bowel. Useful injections are sulphate of iron (gr. ii to 3 i) or liq. hamamelidis (3 j) night and morning. If this fails to check the haemorrhage, operation should be undertaken.

Arterial piles cause arterial bleeding, which is only rarely relieved by palliative measures, e.g., the above-mentioned injections. Prolapse is infrequent, but a tumour or tumours may be felt on digital examination. For the relief of this condition, operation has generally to be undertaken.

Venous haemorrhoids cause symptoms owing to the haemorrhage and discharge which they occasion, but more frequently by becoming prolapsed. Prolapse takes place at

stool only at first; later on, at other times; and finally prolapse may be continuous, and the sphincter so stretched that the patients are unable to retain flatus and faeces. Venous tumours may often be relieved by attention to general principles, such as regular exercise, avoidance of excesses at table, and maintenance of regular action of the bowels. Aperients which are found to suit individual patients best should be given. One or other of the following may be selected:—Sulphate of magnesia, confection of senna and sulphur, rhubarb pill, mercury pill, colocynth and hyoscyamus pill. Should palliative measures fail to relieve; should the tumours be very large; should haemorrhage or discharge be profuse; and should a marked tendency to prolapse be present, operation must be undertaken.

It not infrequently happens that internal piles prolapse and become grasped by the sphincter ani and occasion severe pain. Should the practitioner be called to such a case he should apply a 10- or 20-per-cent. solution of cocaine to the prolapsed portion, waiting a few minutes for the cocaine to act; and should then by gentle compression and upward pressure endeavour to return the mass. If this manœuvre prove unsuccessful, the application of cold may reduce the size of the tumour and then reduction may be successful. If this be unsuccessful, suppuration and the separation of sloughs should be encouraged by warm applications, some soothing ointment being at the same time applied.



GENERAL INDEX

TO VOLUME LXXII.



A.

	PAGE
Air-passages, upper, diseases of	270
ALCOCK, RICHARD : Ovarian cyst and sarcoma	596
Ambulance service for London	625, 788
Anastomosis, abdominal, mode of performing	251
ANDREWS, OCTAVIUS W. : Method of estimating the number of leucocytes	848
Ankylostomiasis	321
Antityphoid inoculation	118, 188, 191, 350, 473
Aorta, coarctation of	284
Aseptic midwifery, plea for	545
Atrophy, progressive muscular, Lectures on	483, 639
— — — — , and allied diseases	629

B.

Black urine	383
BOLTON, CHARLES : Rigors in typhoid fever	106
BOYD, STANLEY : Cancer of the mouth and fauces	397
BRAND, A. T. : Correspondence (nature of cancer)	331
Breeding of human beings	471
British gynaecology	474
British Medical Association at Oxford	935
BROADBENT, Sir W. : Enteric or typhoid fever	1
Bronchiectasis, use of X-rays in	235
BUSHNELL, F. G. : Health-factor in education	464

C

Camps, enteric-fever infection in	47
Cancer, grouping of cases	292
— combatants	322
—, infectivity of	323
—, mortality in Chelsea	292
— of the intestine	630
— of mouth and fauces	397
CANNEY, H. E. LEIGH : Prevention of enteric fever	81
CANTLIE, JAMES : Typhoid fever in China	38
Carcinoma of the colon	525
CARLESS, ALBERT : Recent work on hernia	256
CASES WITH COMMENTS : Incomplete coarctation of the aorta, 284 ; ruptured ovarian cyst; peritoneal sarcoma, 596 ; acute necrosis of the lining membrane of the bladder, 907.	
CATTLE, C. H. : Incipient consumption and sanatoria	218
Cerebral and mental disease in general medicine	561
China, enteric fever in	38

	PAGE
Chlorosis, treatment of -	329
Coarctation of the aorta -	284
COLLINS, E. TREACHER: Recent ophthalmology -	452
Colon, carcinoma of the -	525
COMMON AILMENTS AND THEIR TREATMENT: acute pneumonia, 634; haemorrhoids, 944.	
Consumption, diagnosis of incipient -	218
COOPER, E. R.: Aseptic midwifery -	545
CORNER, EDRED M.: Sarcomata of the alimentary canal -	810
Coroner's Courts -	938
CORRESPONDENCE: nature of cancer -	331

D.

DEAN, C. W.: Necrosis of lining membrane of the bladder -	907
Diabetes, dietetic treatment of -	800
Diagnosis of enteric fever -	335, 473
Diet in gout -	668
— diabetes -	800
— disease -	935
Diseases of the upper air-passages -	270
Displacement of the uterus, treatment of -	707
DORR, S. ERNEST: Treatment by X-rays -	918
Dressing, permanganate of potassium as -	348
DUNCAN, ANDREW: Enteric fever in India -	20
Dust-disposal -	787

E.

Eczema, two lectures on -	202, 416
Egypt, enteric fever in -	6
—, medical history in -	430
—, Mediterranean or Malta fever in -	791
—, relapsing fever in -	653
—, typhus in -	506
EDEN, T. WATTS: Displacement of the uterus -	707
English, the King's -	940
Enteric fever -	I, 182
—, aetiology and prevention of -	81
—, diagnosis of -	335, 473
—, in camps -	47, 185
—, in China -	38
—, in Egypt -	6
—, in India -	20
—, in London -	55
—, infection, conveyance of -	55, 183
—, inoculation against -	118, 188
—, organism of -	182
—, prevention of -	81, 185
—, rigors in -	106
—, serum-test for -	186
—, serum-treatment of -	187
—, treatment of -	189
ETLINGER, FREDERICK K.: Hygienic surgery -	131, 145, 161, 189
	—, —, 552

F.

FAIRBANK, H. A. T.: Sarcomata of alimentary canal -	810
Food and drink, pure -	911
FOTHERGILL, W. E.: Chronic metritis and endometritis -	439
FRENCH, HERBERT: Leucocyte counts in appendicitis -	829

GENERAL INDEX.

949

G.

	PAGE
Garden cities -	471
GARROD, ARCHIBALD E.: Black urine -	383
Gastro-enterostomy, method of performing -	251
Gout, diet in -	668

H.

HARRIS, WILFRED J.: Recent neurological literature -	885
HAWKINS, HERBERT P.: Treatment of enteric fever -	145
Hernia, recent work on -	256
HEWLETT, R. TANNER: Paratyphoid fever -	173
History, medical, in Egypt -	430
Home relief, congress of -	628
HUTCHISON, ROBERT: Dietetic treatment of diabetes -	800
Hygiene in elementary schools -	472
Hygienic surgery -	552
Hypnotism -	301

I.

India, enteric fever in -	20
Infectivity of phthisis -	627
Inoculation, antityphoid -	118, 188, 191, 350

K.

KER, CLAUDE B.: Diagnosis of enteric fever -	335
KING, D. BARTY: X-rays in bronchiectasis -	235

L.

Leucocyte-counts in appendicitis -	829
Leucocytes, method of enumerating -	848
Leucocytosis as a guide to diagnosis -	848
London, typhoid infection in -	55
LUFF, ARTHUR P.: Diet in gout -	668

M.

MCCRAB, THOMAS: Treatment of enteric fever -	161
MACKENZIE, HECTOR: Perforation in typhoid fever -	157
MACLEOD, J. M. H.: Seborrhoea -	755
Malignancy of ovarian cysts -	733
Malignant neoplasms, nucleus in -	729
Medical history in Egypt -	430
Mediterranean fever in Egypt -	791
Metritis and endometritis, chronic -	439
Microscopy, new method of -	475
Midwifery, aseptic -	545
Milk, perils in -	321
MOORE, Sir J. W.: Treatment of enteric fever -	131
MOTT, F. W.: Progressive muscular atrophy -	483, 639
MOYNIHAN, B. G. A.: Method of intestinal anastomosis -	251
MURRAY, GEORGE R.: Coërcitation of the aorta -	284

N.

PAGE

NEWMAN, GEORGE : Typhoid infection in London, 55 ; Recrudescence of small-pox, 765.	182, 319, 470, 625, 783, 935
NOTES BY THE WAY	182
NOVELTIES AND NOTICES : <i>Case-book for Practical Nursing</i> , 325; <i>Homatogen</i> , 325; <i>Allenbury's Milk-food Chocolate</i> , 325; <i>Tablet Hyd. perchlor. et Pot. iod.</i> , 326; <i>Triscuit and Shredded Wheat</i> , 326; <i>Cadbury's Chocolate</i> , 326; <i>Boyd's Banana Malted Food</i> , 327; <i>Fussell's Sterilised Cream</i> , 327; <i>Brand's Fever Food</i> , 327; <i>Kutnow's Effervescent Carlsbad Powder</i> , 476; <i>Brand's Albuminous Essence of Beef</i> , 476; <i>Arabella Natural Mineral Water</i> , 632; <i>Antiphlogistines</i> , 632; <i>All-glass Serum Syringes</i> , 632; <i>Tablets Tribromide Effervescent</i> , 633; <i>Royal Double Cream Cheddar Cheese</i> , 633; <i>Homaboloids</i> , 942; <i>Formolypol</i> , 942; <i>Hemisine Preparations</i> , 943; <i>Kepfer Malt-Extract with Haemoglobin</i> , 943; <i>Quassin Envolts</i> , 943; <i>Jaeger Pure-wool Under-clothing</i> , 943.	
Nucleus in malignant neoplasms	729
Nutrient enemata	330

O.

Obesity, some aspects of	718
Old age	687
Ophthalmology, Congress of	790
— recent work on	452
Ovarian cyst followed by sarcoma	596
— cysts, malignancy of	733
Oxford Professorship of Medicine	189
Oysters, growth and pollution of	783

P.

Pancreas, recent work on	570
PARKES, LOUIS C. : Cancer mortality in Chelsea, 292; Sanatoria for London consumptives, 601; The purity of food and drink, 911.	
Parks and parasites	789
Paratyphoid fever	173
PATERSON, PETER : Nucleus in malignant growths	729
Pathology, text-books of, and their teaching	773
Permanganate of potassium as a dressing	328
Phtisis, infectivity of	627
Pneumonia, treatment of	634
Polypus, nasal	275
POYNTON, F. J. : Arthritis	864
Prescribing, the art of	323
Professorship of Medicine in Oxford	189, 319
Progressive muscular atrophy	483, 939, 629
PUBLIC HEALTH : Cancer-mortality in Chelsea, 292; Health factor in education, 464; Sanatoria for consumptives, 601; Recrudescence of small-pox, 765; Pure food and drink, 911.	

R.

RANKIN, GUTHRIE : Old age	687
Recent work on cerebral and mental disease	561
— — — — disease of the pancreas	570
— — — — diseases of the upper air-passages	270
— — — — diseases of the nervous system	885
— — — — gastric affections	739
— — — — hernia	256

GENERAL INDEX.

95t

	PAGE
Recent work on metritis and endometritis	439
— ophthalmology	452
— rheumatism and arthritis	864
— skin-diseases	755
Relapsing fever in Egypt	653
REVIEWS OF BOOKS : <i>Surgery; its Theory and Practice</i> (Walsham and Spencer), 305 ; <i>The Elements of Pathological Anatomy and Histology</i> (Lazarus-Barlow), 306 ; <i>A Textbook of Pathology and Pathological Anatomy</i> (Schmaus), 309 ; <i>Tumours, Innocent and Malignant</i> (Bland-Sutton), 309 ; <i>Cancer: its Causation and its Curability without Operation</i> (Bell), 310 ; <i>Cliniques Médicales Iconographiques</i> (Haushalter, Etienne, Spillmann and Thiry), 312 ; <i>Tropical Diseases</i> (Manson), 313 ; <i>Maladies des Pays Chauds</i> (Manson, Guibaud and Brengues), 313 ; <i>A Treatise on Massage</i> (Graham), 314 ; <i>Lectures on Massage and Electricity in the Treatment of Disease</i> (Stretch Dowse), 314 ; <i>Our Baby; for Mothers and Nurses</i> (Hewis), 315 ; <i>Practical First Aid</i> (Robertson), 315 ; <i>The Wife and Mother</i> (Vincent), 316 ; <i>The Story of Life; for the Use of Mothers of Boys</i> (Hopkins), 317 ; <i>The Pharmaceutical Action and Therapeutic Uses of the Nitrites</i> (Leech and Wild), 317 ; <i>The Operations of Surgery</i> (Jacobson and Steward), 477 ; <i>The Errors of Accommodation of the Eye and their Treatment</i> (Clarke), 479 ; <i>Golden Rules of Refraction</i> (Maddox), 480 ; <i>The Practical Details of Cataract Extraction</i> (Herbert), 480 ; <i>Lehrbuch der allgemeine Pathologie und Therapie innerer Krankheiten</i> (Schmidt), 481 ; <i>Diseases of the Pancreas and their Surgical Treatment</i> (Robson and Moynihan), 609 ; <i>A Manual of Medicine</i> (Munro), 610 ; <i>Wheeler's Handbook of Medicine and Therapeutics</i> (Jack), 611 ; <i>Paul Gutmann's Lehrbuch der klinischen Untersuchungsmethoden für die Brust- und Unterleibs-Organe</i> (Klemperer), 611 ; <i>A Textbook of the Practice of Medicine</i> (Anders), 612 ; <i>A Textbook of Pathology</i> (Stengel), 612 ; <i>Medical Microscopy</i> (Oertel), 613 ; <i>A Textbook of Legal Medicine and Toxicology</i> (Peterson and Haines), 613 ; <i>Surgical Bandaging and Dressings</i> (Smith), 614 ; <i>Uric Acid as a Factor in the Causation of Disease</i> (Haig), 614 ; <i>Plant Disease and its relation to Animal Life</i> (Wright), 615 ; <i>Progressive Medicine</i> (Hare), 616 ; <i>Diseases and Injuries of the Eye, and their Medical and Surgical Treatment</i> (G. & A. Lawson), 616 ; <i>Atlas and Epitome of Human Histology and Microscopic Anatomy</i> (Sobotta and Huber), 618 ; <i>Suggested Standards of Purity for Foods and Drugs</i> (Moor), 619 ; <i>Comparative Odontology</i> (Underwood), 620 ; <i>Mucous membranous Enterocolitis</i> (Langenhan), 620 ; <i>Manual of Intra-gastric Technique</i> (Herschell), 621 ; <i>Moore's Family Medicine and Hygiene for India</i> (Walsh), 623 ; <i>Journal of the Royal Army Medical Corps</i> , 624 ; <i>Diseases of the Gall-bladder and Bile-ducts</i> (Robson and Dobson), 780 ; <i>St. Bartholomew's Hospital Reports</i> (Garrod and Eccles), 780 ; <i>Progressive Medicine</i> (Hare and Landis), 781 ; <i>Transactions of the Association of American Physicians</i> , 781 ; <i>The Medical Society's Transactions</i> (Hutchinson and Caley), 782 ; <i>A Manual of Obstetrics</i> (King), 782 ; <i>Elements of Surgical Diagnosis</i> (Pearce Gould), 928 ; <i>Modern Surgery, General and Operative</i> (Da Costa), 929 ; <i>Modern Bullet Wounds and Modern Treatment</i> (Smith), 931 ; <i>The Principles and Practice of Surgery for Students and Practitioners</i> (Vaughan), 931 ; <i>A Treatise on Diseases of the Rectum, Anus, and Sigmoid Flexure</i> (Mathews), 932 ; <i>Aids to Surgery</i> (Cumming), 932 ; <i>The After-treatment of Operations</i> (Mummery), 933 ; <i>The Sterilisation of Urethral Instruments</i> (Herring), 934.	

S.	
Sanatoria, cases suitable for	218
— for London consumptives	601
— for the tuberculous poor	625

	PAGE
SANDWITH, F. M.: Enteric fever in Egypt, 6; Medical history in Egypt, 430;	
Typhus in Egypt, 506; Relapsing fever in Egypt, 653; Mediterranean	
fever in Egypt, 791.	
Seborrœa and the seborrhœides	755
Shell-fish and Sewage	783
Small-pox, recrudescence in London	765, 788
— isolation in Germany	939
Standardisation of drugs	937

T

Tape-worm, treatment of	-	-	-	-	329
TAYLOR, FRANK E.: Malignancy of ovarian cysts	-	-	-	-	733
Theobromine in cardiac cases	-	-	-	-	328
THOMSON, H. CAMPBELL: Cerebral and mental disease	-	-	-	-	561
THOMSON, ST. CLAIR: Diseases of the upper air-passages	-	-	-	-	270
TOOTH, H. H.: Enteric fever in camps	-	-	-	-	47
Treatment by X-rays	-	-	-	-	918
TREVOR, R. SALSBURY: Diseases of the pancreas	-	-	-	-	570
Tuberculosis, notification of	-	-	-	-	627
Typhoid fever, <i>see</i> Enteric fever.	-	-	-	-	
Typhus in Egypt	-	-	-	-	506

四

UNWIN, W. H.: Cancer of the mouth and fauces	-	-	-	-	397
Urine, black	-	-	-	-	383
Uterine muscle, life-history of	-	-	-	-	439
Uterus, backward displacement of	-	-	-	-	707

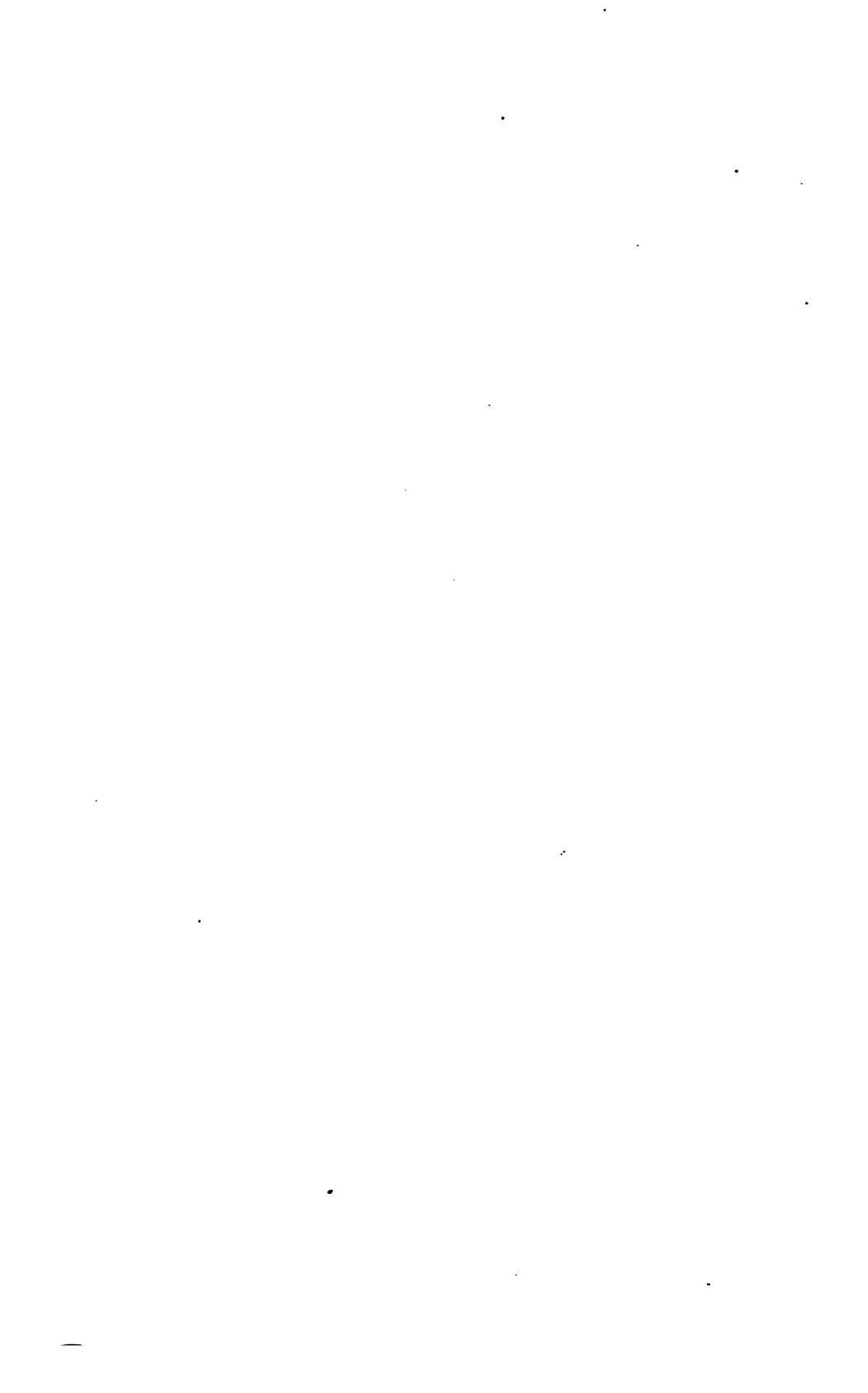
W.

WHITFIELD, ARTHUR : Two lectures on eczema	-	-	-	-	416
WILLIAMS, LEONARD : Some aspects of obesity	-	-	-	-	718
Workhouses, our	-	-	-	-	320
WRIGHT, A. E. : Antityphoid inoculation	-	-	-	118, 191, 350	

x.

X-rays in bronchiectasis - . . . - . - - - 235







EC 30 1904

~~HB~~

~~HOT~~

3-2044



